Massachusetts...Creating the future

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THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE DEPARTMENT
STATE HOUSE BOSTON 02133

[illegible] development and a strong, aggressive program for economic growth [illegible] creation [illegible] cooperation between the public and private sectors will set the tone of the Massachusetts economy in the coming years.

Central to our economic goals is our decision to help Massachusetts-based industry grow within the Commonwealth. We are expanding the State's innovative financial assistance agencies, whose sole purpose is to help local businesses grow. And our series of regional economic development conferences have been designed to improve government communications with business and labor leaders.

The success of all economic development efforts is directly linked to the overall quality of life in Massachusetts. And so, a statewide effort providing the necessities of life to those in desperate need has been launched. In addition, a program of state aid to our cities and towns for increased law enforcement and crime prevention will make our communities healthy and safe.

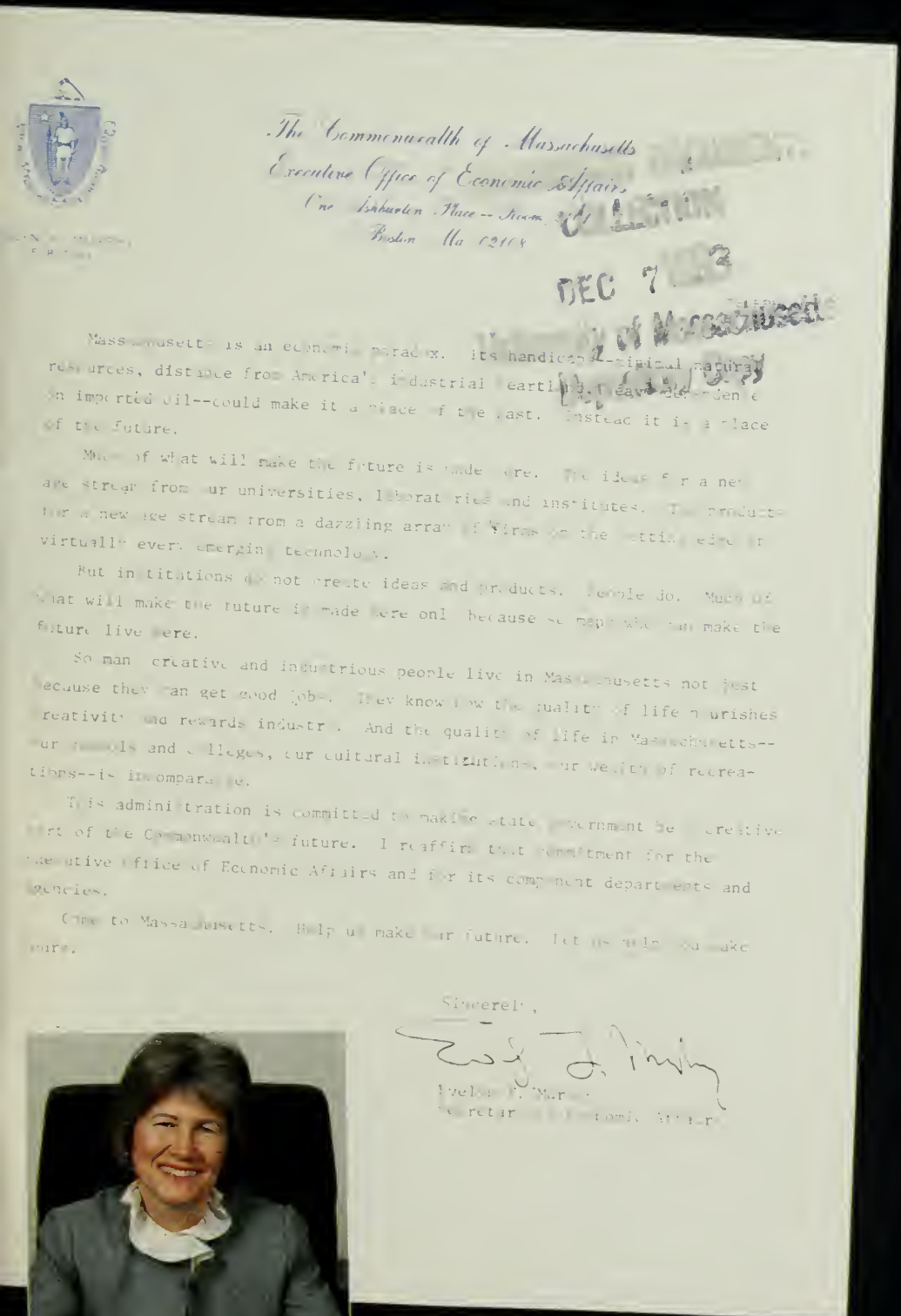
Massachusetts is prospering! Our unemployment rate has been well below the national average since October of 1979. The Commonwealth experienced a record number of industrial expansions in 1981 with 401 company expansions creating over 40,000 jobs for our people.

We can be proud of Massachusetts. Yet, there is much still to be accomplished.

Sincerely,

Michael S. Dukakis
MICHAEL S. DUKAKIS
Governor

An Innovative Society



The Commonwealth of Massachusetts
Executive Office of Economic Affairs
One Ashburton Place -- Room 2101
Boston Ma 02108

DEC 7

Massachusetts is an economic paradox. Its handicaps--minimal natural resources, distance from America's industrial heartland, heavy dependence on imported oil--could make it a place of the past. Instead it is a place of the future.

Much of what will make the future is made here. The ideas for a new are stream from our universities, laboratories and institutes. The products for a new age stream from a dazzling array of firms on the cutting edge in virtually every emerging technology.

But institutions do not create ideas and products. People do. Much of what will make the future is made here only because so many who can make the future live here.

So many creative and industrious people live in Massachusetts not just because they can get good jobs. They know how the quality of life nourishes creativity and rewards industry. And the quality of life in Massachusetts--our schools and colleges, our cultural institutions, our wealth of recreations--is incomparable.

This administration is committed to making state government be a creative part of the Commonwealth's future. I reaffirm that commitment for the Executive Office of Economic Affairs and for its component departments and agencies.

Come to Massachusetts. Help us make our future. Let us help you make yours.

Sincerely,

Evelyn F. Murphy
Secretary of Economic Affairs

There is no coal or oil or iron in Massachusetts: nothing to pump or mine. The land is far from the most fertile in the Union. For the most part, the only natural resources of which the state can boast are fresh air and clear water. For all else, throughout our history, we have been dependent on the skill, imagination, and resourcefulness of our citizens; on their faith in progress; and on their belief that the responsibility for improving the world rests with those who see how it can be done.

Our success directly reflects our ability to cultivate and reward those qualities. One measure of this success is the economic vitality of the Commonwealth itself. A second is the extraordinary number of innovations—in science, industrial organization, art, medicine, education, and the law—devised here over the past two centuries. Many of these innovations have set the standard for accepted practice in a field or formed the base for new industries. Still a third measure is the sheer duration of this flow of innovations. Beginning about 200 years ago and continuing to the present day, Massachusetts has been responsible, decade after decade, for a number of innovations far out of proportion to her population.

The intent of this publication is to show the character of life in this multifaceted, innovative society. We will be describing our history and prospects, our strengths and weaknesses. Our audience is those persons who wish to do more than create a future for themselves alone—who want to create one for the nation as well.

View points: Business people talk about Massachusetts

"The phenomenon that led to the improvement of business in the seventies in Massachusetts was the data processing or communication or computer business, depending on how you want to characterize it. The growth business of the eighties and nineties is clearly going to be biotechnology or microbiology. The improvements made in the ability to change the genetic structure of materials is going to influence not only agriculture, but basic materials. It's going to have an enormous effect on health and welfare and it's going to permeate every section of society. Because we have one of the best medical complexes in the world, the combination of the medical base, high-tech industry, a balanced educational system, improved state government, and the financial and entrepreneurial capabilities of the area, in my opinion, make this area number one in the country. Although in the Northeast, Boston as a financial center is second to New York City, I think this is a much more attractive environment to work in than the New York City environment. We tend to attract more of the venture capital type of finance, which is so important to the building up of our new industries."

EG&G, Inc.
Wellesley, Massachusetts
Mr. Bernie J. O'Keefe, Chairman

"We can't do anything about the fact that we are up in the Northeast corridor: we pay higher costs for transportation; energy costs are higher; costs of buildings are higher because of the adverse weather. But we can do something about taxes. And, in Massachusetts, up until a couple of years ago, we were paying over 17 percent in taxes as a percent of gross personal income, whereas the competitive industrial states were a little over 15 percent. Now what's happened is that government spending has been reduced by almost a billion dollars a year. At the same time, through the commitment by the High Technology Council and companies like ours that have been making capital expenditures in this state, we have increased the gross personal income in the state by a billion dollars. The aggregate has been enough to bring our taxes down to where we are now competitive with the other industrial states.

In developing new facilities, two items are of great importance to us. First is the basic cost and, second, the availability of skilled technical personnel. If we built a plant at our locations on the West Coast or in Texas, for instance, many costs would be considerably less, but we would not have the advantage of the technical know-how which is present in Massachusetts. Where it might take us a year or two here to develop a new alloy, it might well take us several years in another part of the country. This would be far more costly than any extra energy costs."

Wyman-Gordon Co.
Worcester, Massachusetts
Mr. Joseph R. Carter, Chairman

"This area will become one of the major, if not the major, biotechnology center in the country in part because of the newly created Whitehead Institute and because of the Cambridge community, although it will be more than Harvard/MIT people contributing to biotechnology. I think this community will even be more important in the next decade or two than it has been in the past, and it has always been a major biomedical research center.

People want to come to Massachusetts even though they know the cost is high. We recently recruited a senior executive from Kansas who was working for a very fine pharmaceutical company, and the thought of being in this community, being near the ocean, being in a major cultural center to educate his family was the determining point. He was really very happy where he was, and had a very fine position, a senior position. What brought him here in addition to the position was the thought of moving to Boston—and Boston to me is Massachusetts.

Perhaps that's not a fair statement, but Boston has become such an exciting city and is now known worldwide because of what has happened to it physically. As far as we are concerned as a company, it's very important to us to be in a city where we can move our (laboratory) animals with a high degree of safety. We have major carriers who go to all parts of the world from Boston, and we have a major interstate highway system."

Charles River Breeding Laboratories, Inc.
Wilmington, Massachusetts
Dr. Henry L. Foster, President

"This area is, of course, one of the most intellectually exciting areas in the country, if not the world. That's why I am here. I came here in 1961 for graduate work at the Harvard Graduate School of Design and found the place at once incredibly provocative and extremely abrasive. Intellectually, socially, and economically it offered great promise for me, and it's a promise that has, in fact, been fulfilled in large part.

The set of circumstances that are singly most reponsible for the quality of the place—its richness, vitality, and enormous potential—are also responsible for the friction and abrasion that exist. There are few other places in our country as cosmopolitan as this place, as charged with the multiethnic cultural kind of population as this place—and that should be truly celebrated. Yet, at the same time, it often represents just the reverse of that—fear, suspicion, and ugliness. But for me, the advantages and the great promise of the future, given the potential of the geographic characteristics of the land, the historical and scale-giving qualities of the structures, the intellectual portent of the great institutions, the melting-pot characteristics of the multicultural contacts, make this far and away one of the most interesting and vital and exciting environments that I can imagine living in."

Stull Associates, Inc.
Boston, Massachusetts
Mr. Donald L. Stull, President

"Communities like Fall River, New Bedford, Lowell, and Lawrence are excellent communities for business expansion and growth. There is an abundance of employable help. Our performance in Lowell and Fall River has been excellent in regard to available labor. Our labor turnover on an annual basis is under 4 percent, which we feel is very, very good.

Property for growth or expansion is available at reasonable prices. In Lowell, we purchased an old industrial building a few years ago for $1.50 per square foot and renovated it for another $2.00 per square foot. If we had to build that same structure from scratch, we would have had to pay approximately $25.00 a square foot.

In 1954, we purchased a plant in Hickory, North Carolina, because of the availability of labor, and what we thought at the time was cheaper labor. Today, the wage rate we pay in Hickory is comparable to the wage rate we pay in Massachusetts. The availability of labor in Hickory is under 1 percent so that it is not only the rate you pay that has no differential, but the availability of labor.

No places in the United States have a better labor pool available or such good manufacturing real estate than the old Massachusetts industrial cities.

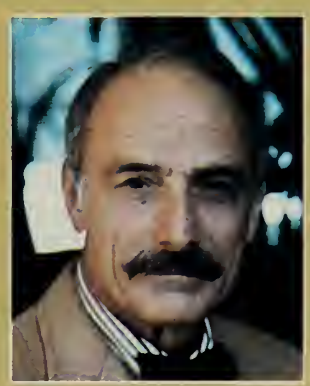
Massachusetts has a lot to offer textile and textile-related industries."

Joan Fabrics, Inc.
Lowell, Massachusetts
Mr. Laurence Ansin, President

"Ours is a high technology business with interaction between research, engineering, and manufacturing. Usually new products are first produced in our facilities in Massachusetts.

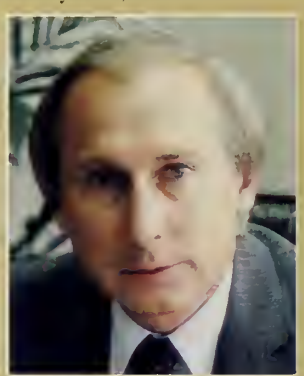
If we were making products such as paper or iron and steel, there are other parts of the world closer to the needed raw materials that would be advantageous locations. But we are a high technology company. We find the environment here attractive and most of the people who come here find it attractive as well. We are near a variety of excellent educational institutions. Because of these educational institutions, there is a constant influx of young people who keep things stirred up. We don't have the rigid, starchy environment one finds in many places. Ours keeps us alive, keeps us reevaluating our attitudes. This is invigorating and productive. It addition, it is easy for those of us who want some extra training or education to acquire it in the area. I was trained as an engineer. However, in the early 1950s, I found that dealing with organic chemistry was difficult because it hadn't been part of my education and I didn't understand the language. So a fellow engineer and I enrolled for organic chemistry at MIT where we could walk across the street to our daily class and then back to work again."

Polaroid Corporation
Cambridge, Massachusetts
Mr. William McCune, Chairman



"One of the greatest strengths Massachusetts has to offer to a high technology business is the availability of industrious and talented human resources. Since we are one of the world's leading producers of highly sophisticated electronic devices and systems used in precision measurement and computerized control, the natural human resources of Massachusetts are essential to our success. I know that we will continue to expand our facilities in Massachusetts because of the proximity of academic and research centers engaged in exploring the frontiers of medicine, industrial automation, navigation, and avionics. Our company profits from being in this environment where the "state of the art" is happening. We also are able to utilize technicians schooled and skilled in the sophisticated software and hardware used in these technologies. We have also witnessed Massachusetts taking steps to create a sounder base for economic development. This helps us as it helps other related industries in the area. We are very optimistic about our future in Massachusetts and the electronic industry."

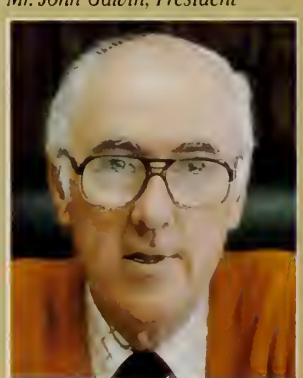
Analog Devices, Inc.
Norwood, Massachusetts
Mr. Ray Stata, President



"Three years ago, I expanded this building and doubled the employment; now I'm the only plastic mold maker in the area with a full CAD/CAM system. I did this with a MIFA (state industrial revenue bond) loan and three local banks that also jumped on the bandwagon to support us. My son's aboard now; he's a Worcester Polytech grad, and he and his people put up another building down the street doing highly specialized technical work for the high-tech industry. For instance, a computer company came in here recently with sketches for five molds they needed. It took us 120 hours to do all of them with our CAD equipment and we're now already cutting the steel and making the first molds. That's what CAD/CAM does for us, and that's what's going to get the initiative back from the Japanese for us.

I don't think Massachusetts and its people have to take their hats off to anybody. We're surrounded by really good trade schools and I think that's been a big advantage for Massachusetts. We've got Montachusetts Regional Voc-Tech School, and there's another one in Lexington and one in Worcester that is also very good. And now the community colleges are getting on the bandwagon and are being very, very helpful to industry, particularly where machinists are involved. Getting that skilled manpower, that's the basic premise. Beyond that, I think Leominster is great. You can't say enough about this town. They have been super to us on the political end of it and the tax side."

Burton Tool and Die, Inc.
Leominster, Massachusetts
Mr. John Galvin, President



"Massachusetts is an area in which the Strathmore Paper Company is comfortable and well known. Our roots here are deep, going back to our founding in 1892—90 years ago.

The livability of our communities, the quality of our people, our proximity to transportation facilities—all of the conventional yardsticks—are impressive.

And I am not looking through rose-colored glasses when I say Strathmore regards itself as the beneficiary of a relatively favorable tax base . . . the combination of state taxes and local property taxes.

Because our taxes in relation to our growth have been relatively static, we have been able to invest more heavily in the region than we would have otherwise. At our Westfield and Woronoco plants, for example, we have in the past five years invested $15 million in plant improvement and equipment.

Our plans presently call for continued expansion here to cater to an expanding market. We have, as I mentioned, all of the advantages that we need to capitalize on that opportunity."

Strathmore Paper Co.
Westfield, Massachusetts
Mr. John Gallup, President

"I love living in the Berkshires. It's a very special place; you can go all over the world and you'll never find a place like the Berkshires. It's rural, yet it has business; it has the arts; it has beautiful scenery; it has all the sports; and it has a very interesting mix of people. The people who live in the Berkshires and particularly right in this area are not the usual small town kind of person. You have famous writers like William Shirer or William Gibson and, of course, Norman Rockwell was here. We have a lot of well-known writers and artists and creative people. You can find any kind of a creative person here, and the people are marvelous, hard working, well educated, caring kinds of people. They make doing business in Massachusetts a joy."

Country Curtains
Stockbridge, Massachusetts
Mrs. Jane Fitzpatrick, Owner

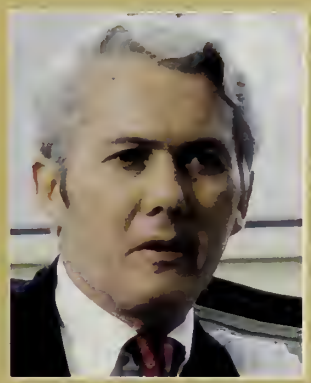
"Wang Laboratories is a major wordwide manufacturer of small computer and word processing systems. I attribute much of our company's success to the skill and industriousness of our employees, most of whom live and work in Massachusetts. Massachusetts offers a good environment in which Wang Laboratories can continue to grow."

Wang Laboratories, Inc.
Lowell, Massachusetts
Dr. An Wang, President

"I do a lot of traveling both in the United States and worldwide and I find most people are really very attracted to Massachusetts because of the quality of life. There is still a feeling that Boston is really the Athens of the East, and there is a very strong attraction to the Berkshires and to Western Massachusetts for the quality of life. I think people in the Commonwealth are sometimes a little too sensitive to what they perceive to be their own problems.

People come to Westfield (where we are) and they're amazed. Here we are operating businesses in Europe and South America and now into Southeast Asia and they wonder why we don't move to a large, cosmopolitan center. But we simply point this out: where else can you have a quality of life where you are 15 minutes from good skiing, 45 minutes from superb skiing; 45 minutes from Tanglewood; an hour and a half from Boston; two hours and a half from New York City. Also, our international people love it because they come into Logan (in Boston), and it's just a nice drive over here. People take one look at all this and they say, 'Hey, I'd almost pay you to come to work here.'"

Stanhome Inc.
Westfield, Massachusetts
Mr. H. L. Tower, President



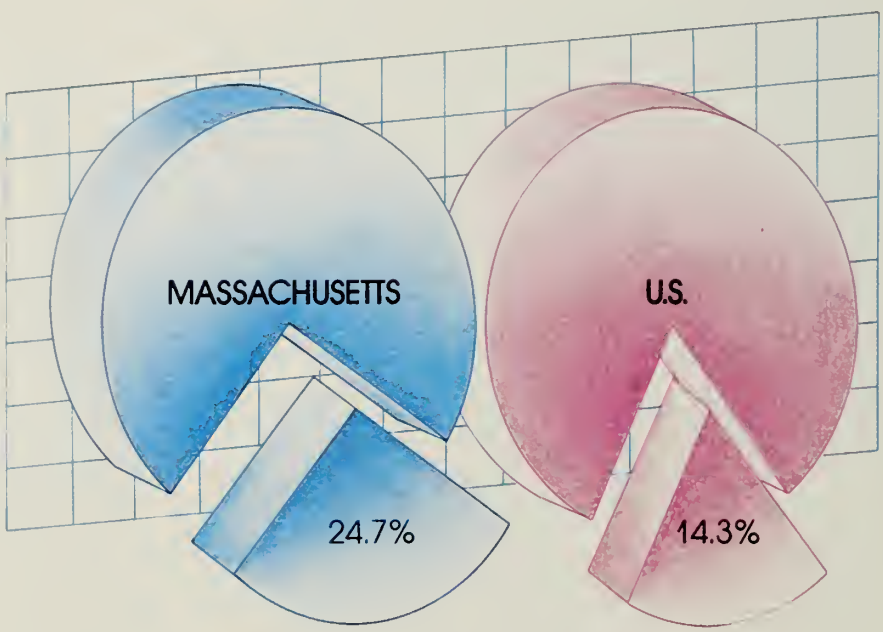
Shaping the Future

A few decades after the new nation declared itself, won its independence, and adopted its constitution, a flow of inventions and innovations began to arise in Massachusetts. These new ideas came in all fields of activity: literature, theology and philosophy, public affairs, science, medicine and, far from least, in the arts of mechanical invention. Looking just at those innovations which became the base of new industries, examples would include the principle of interchangeable machine parts (which made possible dozens of industries); the fabrication of the first American steam machinery, including the locomotive; the telephone; the electric transformer (which made the industrial production of electricity possible); and the internal combustion engine. In this century, Massachusetts inventors hit upon the principle of frozen foods; designed and assembled the first analog *and* digital computers; created instant photography; initiated a large number of important innovations in computer design, crowned by the invention of minicomputer architecture; and, most recently, made a host of breakthroughs in robotics and biotechnology that are being translated into products for tomorrow.

American industrial history can be divided into three phases: the mechanical, electrical, and cybernetic. Some would add a fourth, not yet fully on us, that of biotechnology, or the engineering of living tools. In each of these, Massachusetts has pointed the way. There is a sense in which we have always stuck to one line of business: creating the future—acting as an incubator for the high technology of the time, whether it be clipper ships, the telephone, CAD/CAM technology, or recombinant DNA.

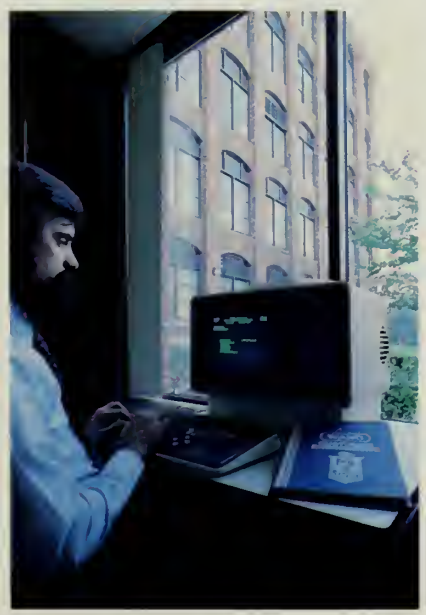
In the pages that follow, we shall be offering some views as to why such a small state should have played such a large role for so long. In essence, it has to do with the gradual accumulation of large reserves of skilled manpower and specialized services, a substantial research community, a quality of life attractive to innovative sensibilities, and the proper assistance of the public sector.

A complete analysis is difficult because it is hard to separate cause and effect. What is a resource for an innovative society and what is a product? One of our most prized skills is that of recycling our urban building stock. While others discard the effort of prior generations, or at most reclaim a few blocks for the sake of tourism, we renovate our buildings continuously, routinely, for business purposes. Is this skill a resource or a product of an innovative society? Clearly it is both. Perhaps this skill is best seen as an instance of the fundamental strength of a society such as ours, which is the ability to create its own resources.



The concentration of high-level skills is far greater in the Massachusetts economy than in the United States as a whole.

The DSW water stepper system, developed by GCA Corporation of Bedford, prints integrated circuit patterns on silicon wafers.



The Wang Laboratories Customer Engineering Facility in Lawrence is housed in the restored Monomack Mill, originally built in 1906.

Near the end of a stress test, a technician injects a patient with Thallium 201, a New England Nuclear radiopharmaceutical used to diagnose cardiovascular disease.

Cutting drawn optic fibers at AO Scientific Instruments, Southbridge.

The Foundations of Innovation

The Ether Dome at Massachusetts General Hospital (inset) was the site of the first public demonstration of the use of anesthesia in surgery. Today, 125 years later, on the same site, open-heart surgery is performed.

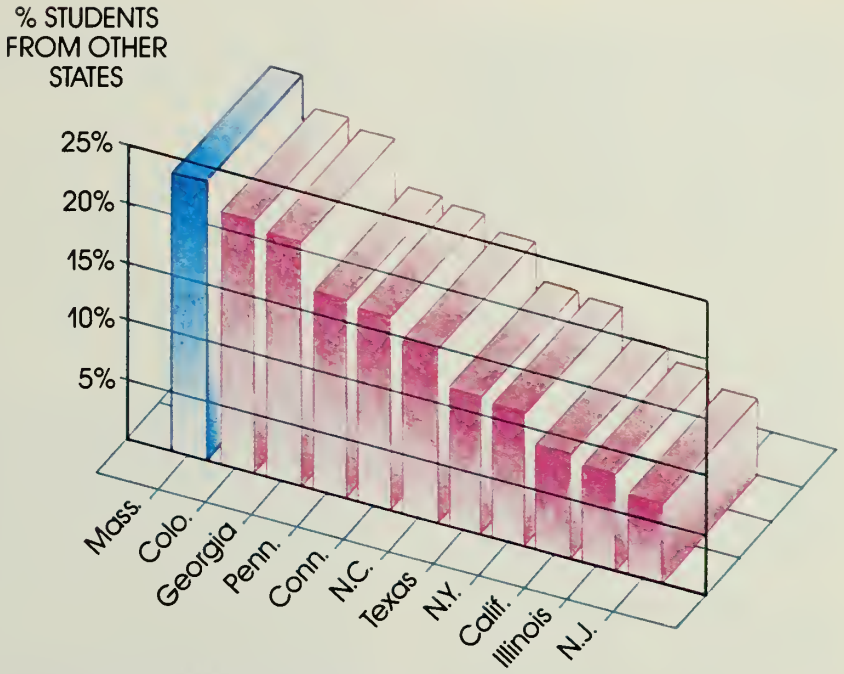
Innovation in any society depends on four factors: imagination, or the power to see what might be and why it would be better; skill, the ability to make dreams real; enterprise, the capacity to build organizations that carry innovations out into the world; and a progressive community that supports innovation while remaining critical enough to distinguish good new ideas from bad new ones.

In the next pages, we will review three of the institutions and traditions that have helped us develop these qualities: a large and varied community of excellent colleges and universities; a tradition of enterprise and entrepreneurship; and an active culture, including a strong sense of history.

Education: a magnet for talent

A strong educational community is absolutely essential to a modern innovative society; it is the rock on which all else is built. A college or a university provides a protected space in which the world can be questioned, dreams for its improvement conceived, and the tools needed to achieve those dreams mastered. Such institutions promote imagination and pass on skills. Over time, and acting together, they create a population that is flexible, open to new ideas, and yet not without a critical point of view.

Massachusetts has as rich and diverse an educational community—120 institutions of higher education—as any in the world. However, this community is unlike others in the large number of colleges and universities it contains with international reputations for excellence. These reputations attract the most energetic, imaginative, creative minds from everywhere in the world. They come as teachers, students, and researchers. They stay to train others, work in industry, do science, consult, and collaborate. The result is a degree of vitality that spills over the boundaries of any one particular institution and charges the society as a whole.



Massachusetts colleges & universities attract proportionately more out-of-state and foreign students than schools in other states.

The creation of industries

During the 1950s, a highway circling Boston, Route 128, became internationally famous as the "Golden Circle"—an area in which large numbers of what were known as "hi-tech" companies established themselves.

At the time, it seemed like a marvel; delegations came to visit from elsewhere in the country and abroad, and many of its features were copied elsewhere. In truth, the Golden Circle was just a recent example of a phenomenon economists call "industrial agglomeration": the organization of a community of related companies, benefitting from each other's presence by the development of specialized manpower pools, service vendors, and information exchanges.

Perhaps the most striking feature of Massachusetts' industrial history is the number of such concentrations that have appeared in the state. In the past, we have supported such industries as shipbuilding, agricultural implements, machine tools, clocks and watches, furniture, textiles, leather goods, and a number of industries based on digital technology. New ones are forming today.

Why should this have been so? In part, no doubt, because innovative companies riding the wave of new technologies benefit the most from having a wide variety of materials, labor, and services available at short notice—and these are the kinds of companies we tend to produce.

But the importance of experience in supporting these concentrations should not be overlooked. As each new industry arises, it adds to a general "infrastructure" of specialized business services, expertise, market research, and consultants. With each new industry that infrastructure becomes more skilled and powerful, with more human and financial capital to offer the next new industry to put down roots and grow.

A power loom at the Pacific Mills in Lawrence (1914)

Route 128 is known as the "Golden Circle," home of hi-tech.

Clipper ship "Flying Cloud" built by Donald McKay, East Boston, 1851

Culture and History: setting a standard of excellence

The cultural resources of Massachusetts have long been cited as one of the key attractions of the state. And it is true that we do combine the satisfactions of life in a traditional culture, where historical references and landmarks are a part of the everyday, with a modern culture in which the full range of sports and the arts are pursued with notable vitality.

Robert H. Goddard invented the first liquid fuel rocket in 1926 and launched it from Auburn, Massachusetts.

Yet the benefits of these cultural resources run deeper than just the pleasure they give. Anyone directing an organization, whether it be a business or a Little League baseball team, knows the value of a tradition of excellence. A history of achievement sets a high standard of performance, while, at the same time, presenting examples of men and women who have reached that standard in the past and thus shown that it can be done. Such a tradition supports a belief in progress by insisting that it is worthwhile to set out to accomplish great ends.

These traditions are an important part of our culture. Their influence is felt in many organizations: by the students at Harvard and MIT, the dancers at Jacob's Pillow, the runners of the Boston Marathon, the actors of the American Repertory Theatre, the physicians at Massachusetts General Hospital, and many others. We are rich with examples of persons who have had extraordinary dreams in science, industry, and art, and translated them triumphantly into reality. That is the foundation of our culture, and it is a resource more important than oil.

Dickinson

Melville

Emerson

Longfellow

Thoreau

Hawthorne

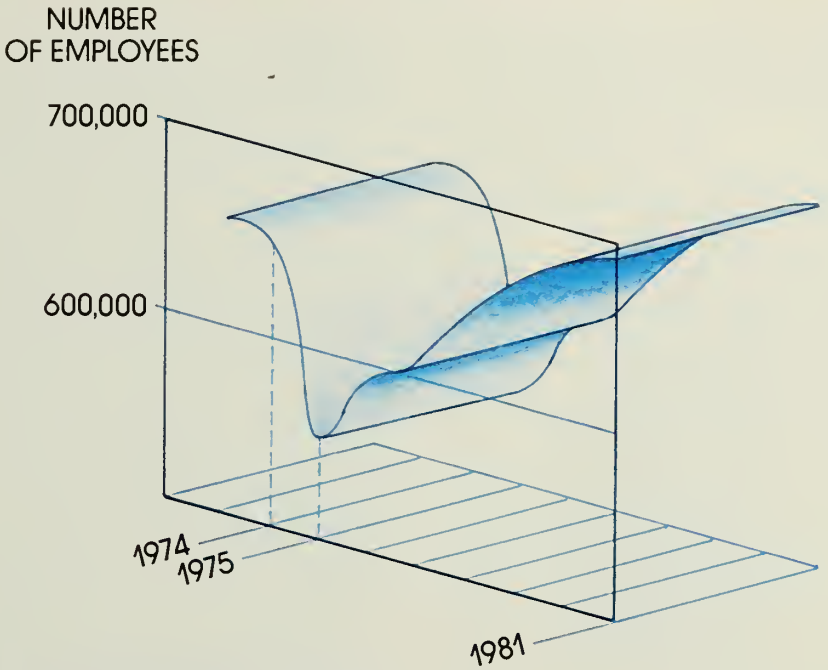
The Battle of Bunker Hill (1775)

Brass Tacks

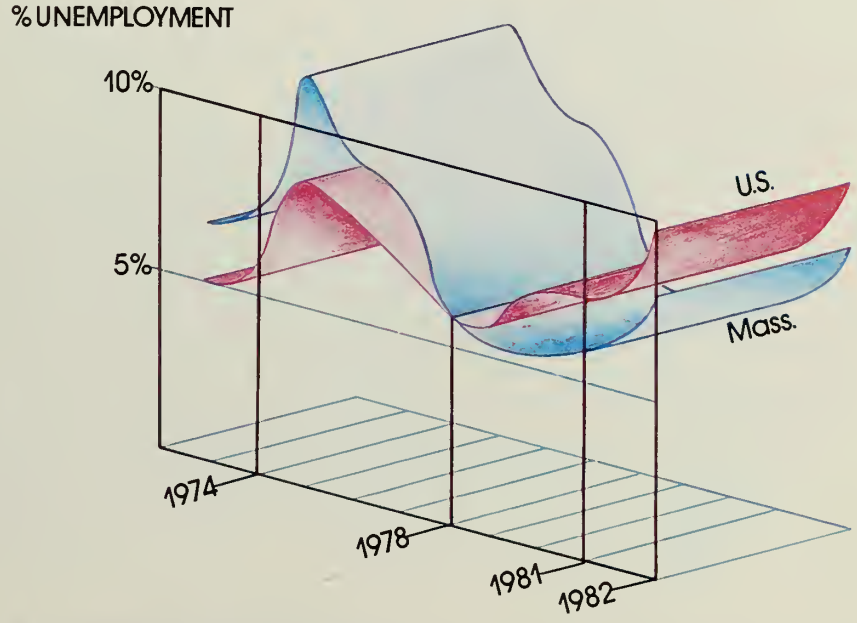
The deep-seated influences that make up the character of a state are important, because their contribution is usually felt in the long run. But business people looking at Massachusetts will also be interested in the issues that a newcomer would face immediately—such as taxes, the health of the economy, the cost of energy, and the quality of the labor supply.

The issue of the health of the state's economy is easily settled. Our unemployment rate has been decreasing relative to the national average for the last six years and below it for the last three. A thousand businesses across the state have expanded in the last three years, contributing to an overall increase of 150,000 jobs. Exactly why Massachusetts has shown this strength is a matter of debate—some say the state is the beneficiary of a structural shift in the national economy from heavy industry to high technology—but that it has occurred is beyond dispute.

The other questions—taxes, energy costs, etc.—are more complicated, in part because there are new developments in each of these areas that are changing traditional views. In the next few pages, we will face up to some of these tough issues—and we will tell you what we are doing to solve them.



Jobs in manufacturing have increased dramatically in Massachusetts as high technology industries have grown.



The changing Massachusetts economy has resulted in unemployment levels well below the US average for several years.

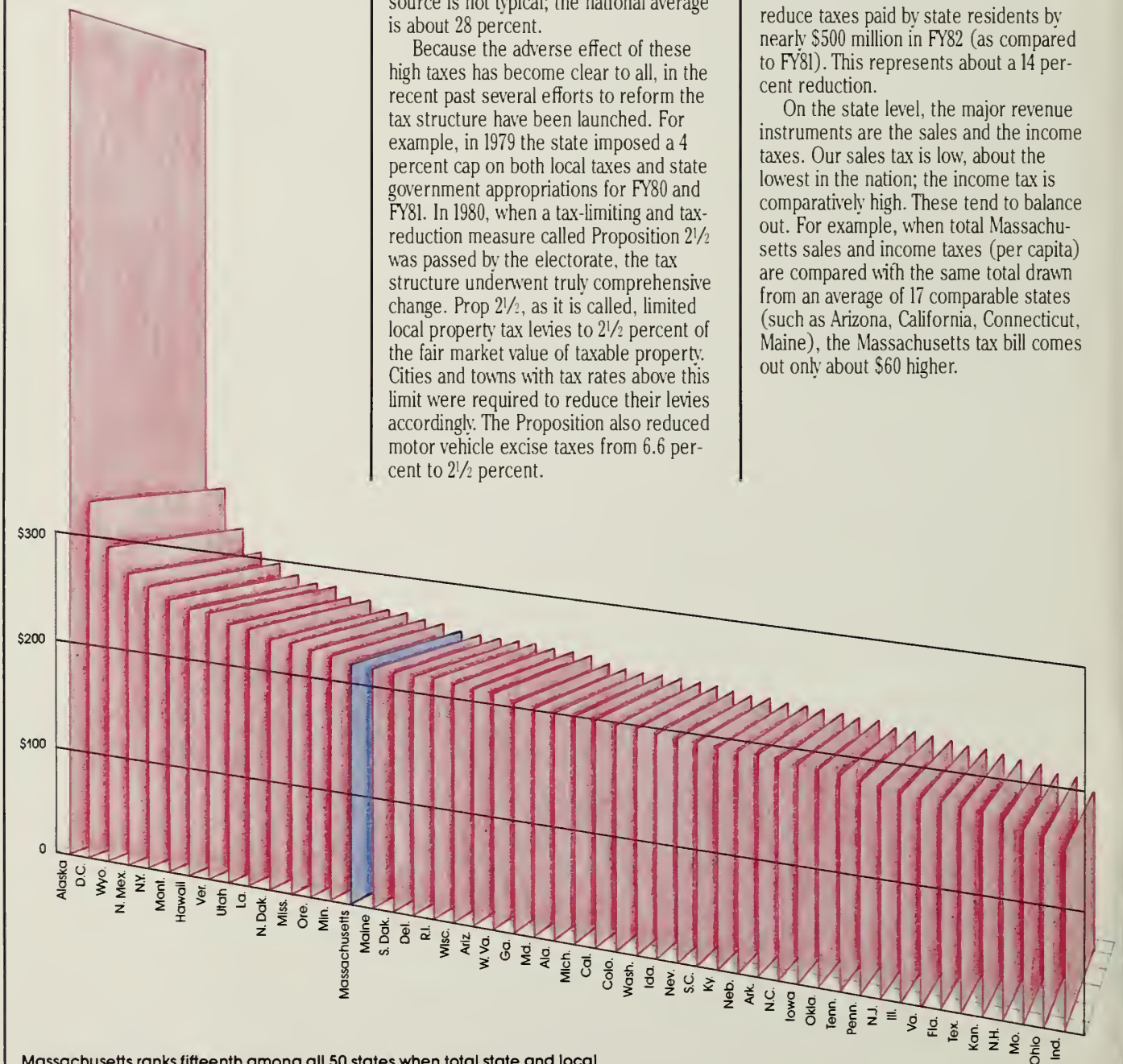
Taxes

Before 1981, local governments in Massachusetts raised half of all their revenues through the property tax. Such a high degree of reliance on this single revenue source is not typical; the national average is about 28 percent.

Because the adverse effect of these high taxes has become clear to all, in the recent past several efforts to reform the tax structure have been launched. For example, in 1979 the state imposed a 4 percent cap on both local taxes and state government appropriations for FY80 and FY81. In 1980, when a tax-limiting and tax-reduction measure called Proposition 2½ was passed by the electorate, the tax structure underwent truly comprehensive change. Prop 2½, as it is called, limited local property tax levies to 2½ percent of the fair market value of taxable property. Cities and towns with tax rates above this limit were required to reduce their levies accordingly. The Proposition also reduced motor vehicle excise taxes from 6.6 percent to 2½ percent.

Prop 2½ has made a substantial difference. 80 percent of the population of the state lives in cities or towns that reduced their property taxes, and all motor vehicle owners had a tax savings. The state estimates that the measure will reduce taxes paid by state residents by nearly $500 million in FY82 (as compared to FY81). This represents about a 14 percent reduction.

On the state level, the major revenue instruments are the sales and the income taxes. Our sales tax is low, about the lowest in the nation; the income tax is comparatively high. These tend to balance out. For example, when total Massachusetts sales and income taxes (per capita) are compared with the same total drawn from an average of 17 comparable states (such as Arizona, California, Connecticut, Maine), the Massachusetts tax bill comes out only about $60 higher.



Massachusetts ranks fifteenth among all 50 states when total state and local taxes and fees are measured in relation to personal income.

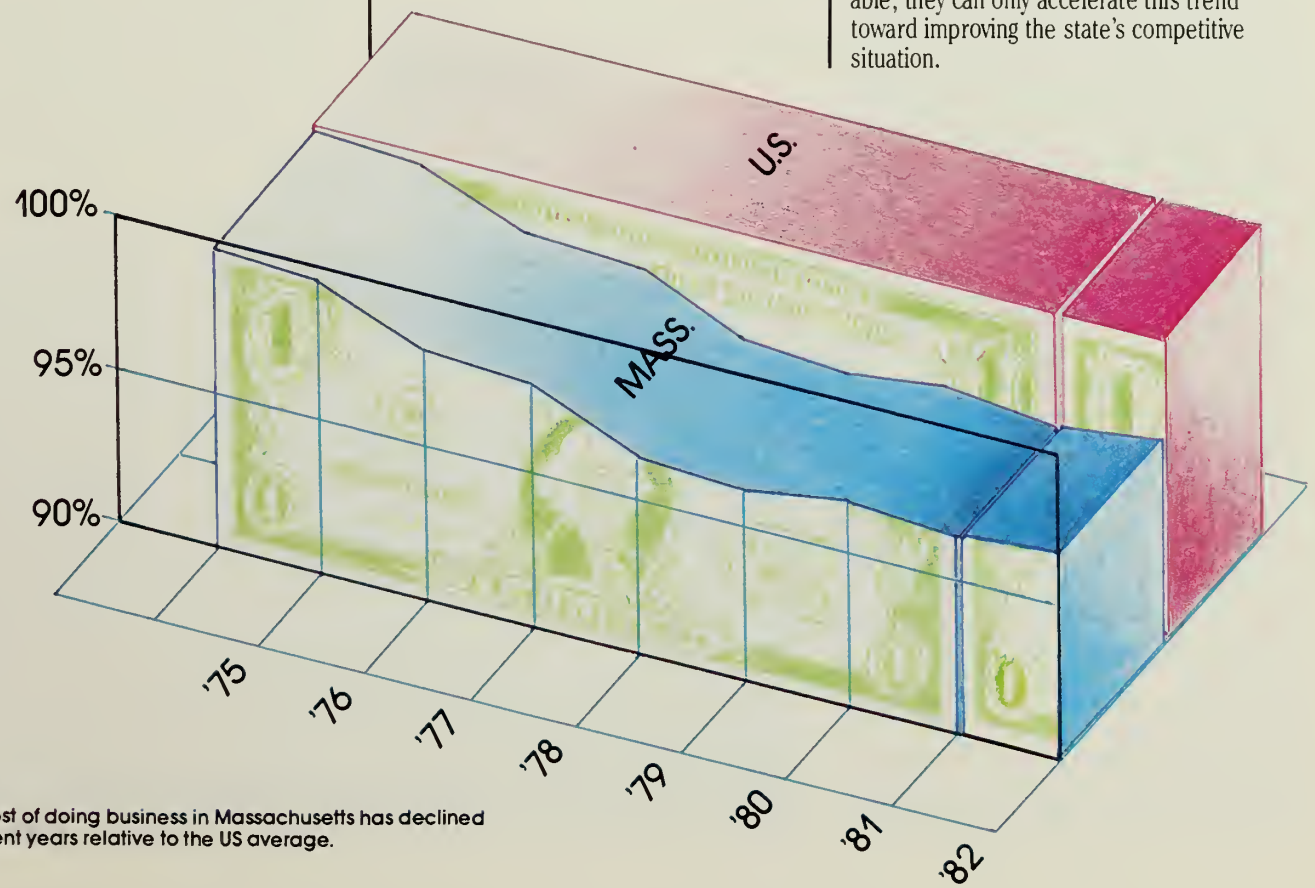
Living Costs

For many years, living costs in Massachusetts—as measured by the Boston Urban Family Budget of the U.S. Bureau of Labor Statistics—have been higher than the national average. This has not been because of some general inflation that has lifted the price of all items; many categories in the UFB are at or below the national average (such as clothing and medical costs). The difference is concentrated in two or three elements—primarily property taxes and auto-related costs—with energy costs having an important, though hidden, influence. (The UFB does not count energy costs separately.) In 1975, this difference between Boston and the national average was 18 percent; over the subsequent five years it shrank steadily but slowly. By 1980—the most recent figures available—it was 15 percent.

In that year, Proposition 2½ passed. This new law was aimed specifically at two of the very categories that made the Boston UFB so high—property taxes and the excise tax on automobile registration. Property taxes were limited to 2½ percent of the fair market value of taxable property, while the motor vehicle excise tax rate was cut 60 percent. It is therefore reasonable to anticipate a significant acceleration in the recent trend toward narrowing the living cost differentials.

There are other measures of the cost of living; one of these is the cost of living "burden." This refers to the bite that living costs take out of one's pocket. Since personal income is higher than the national average here, this measure significantly reduces the apparent difference in costs. Finally, since the difference in personal incomes has been growing while the difference in living costs has been shrinking, a "trendline analysis" which measures the cost of living burden over time would show the strengths of the economy in the clearest light.

A measure of special interest to business people is the cost of doing business. In this measure (which includes principally wages, business taxes, transportation, and interest rates), the story is much the same as with the personal cost of living. For many years, the costs of doing business in Massachusetts have been comparatively higher than the national average. In the last five years, that difference has been shrinking, largely because of decreases in business taxes and less rapid increases in average wages. This means that the average cost of doing business nationwide has been increasing more rapidly than in Massachusetts. While figures on the impact of Prop 2½ on the costs of doing business are not yet available, they can only accelerate this trend toward improving the state's competitive situation.



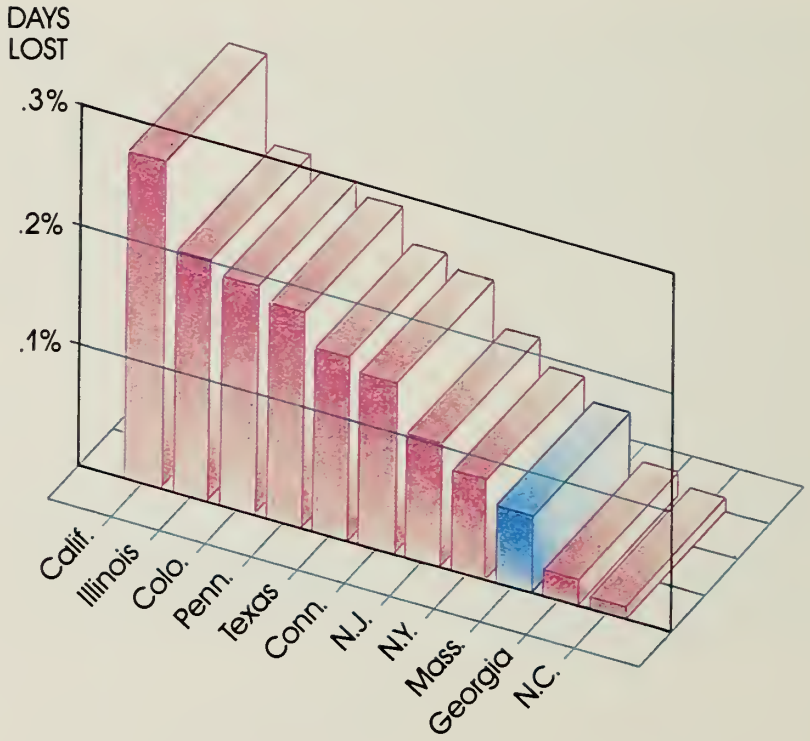
The cost of doing business in Massachusetts has declined in recent years relative to the US average.

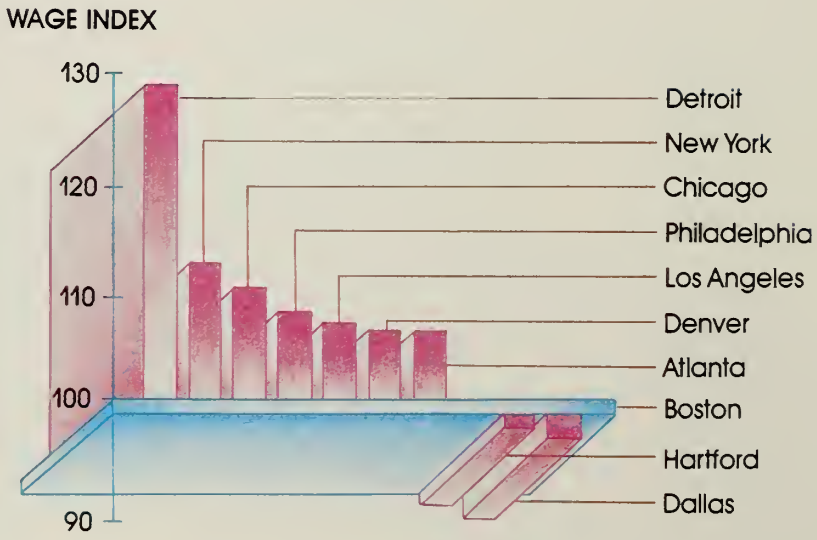
Work force

As the national economy shifts to an emphasis on high technology, other regions of the country are discovering a fact familiar to employers in Massachusetts since the days when high technology meant clipper ships. That is that the most pressing labor problem for those managing a knowledge-intensive business is neither wages nor work attitudes, but manpower availability: getting people with the right skills as they are needed, and then retaining them. There are just not enough of these people nationally. While there is no surplus of them here, either, we think the problem is more manageable here than elsewhere for a number of reasons.

The first reason is the presence of a large number of universities and institutes. These draw students: young men and women from all parts of the country and from abroad who come intending to acquire the very skills in question. Once here, there is a strong tendency to stay. For example, in 1976 the National Science Foundation conducted a technical manpower study in which they contacted a large sample of scientists and engineers who had previously (in a 1972 study) identified a New England college or university as the place where they had had their last experience in formal education. 77 percent of these people were still living and working in the region.

In addition to their role as magnets, attracting and training new generations of high-skill manpower, the colleges and universities (and many research institutes) operate continuing education and professional development programs for managers and workers who need to update their skills or learn new ones. Last year, for example, Northeastern University enrolled approximately 35,000 part-time students in continuing education programs—half in technical courses.



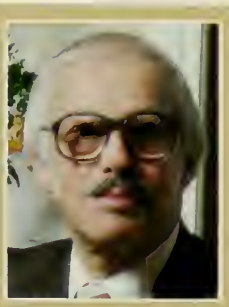


Many of the high technology companies themselves are making significant efforts to deal with the problem of manpower availability. Data General has donated microcomputers to the University of Lowell. Analog Devices has funded academic chairs at MIT, Northeastern, and the University of Lowell. Wang Laboratories has donated $30 million in computer systems to the University of Massachusetts and has recently opened its own degree-granting graduate school of software engineering. Recently, over a hundred Massachusetts companies especially dependent on a high-skill labor force have banded together into the Massachusetts High Technology Council. While the Council takes as its agenda all issues relevant to the operation of a high technology business in Massachusetts, it gives special emphasis to this problem. Recently, the Council asked its members to devote 2 percent of their research and development budgets to engineering education.

The Commonwealth, for its part, has established The Bay State Skills Corporation, a state-funded, quasi-public corporation that provides matching grants for collaborations between educational and private sector institutions aimed at satisfying skilled manpower needs. The definition of skilled manpower is broad; the most recent series of awards included programs aimed at training machine operators, welders, and metal production workers, as well as those skills more commonly associated with high technology, such as microwave engineering.

On other issues, the Massachusetts labor force is attractive. Labor-management relations are excellent. Despite a union membership slightly higher than the national average, time lost to work stoppages is less than half that of the average. New NLRB-supervised certification elections are fewer than in comparable states. Job turnover is lower, and participation rates—the proportion of the population that works—are higher. In a model example of labor-management cooperation, the Massachusetts Building Trades unions helped start the Massachusetts Construction Industry Foundation through which union retirement funds will provide long-term financing for new construction and major rehabilitation projects.

A training program for microwave engineers at University of Massachusetts/ Amherst, supported by The Bay State Skills Corporation



GCA Corporation
Bedford, Massachusetts
Mr. Milton Greenberg, President

"In the past two years GCA Corporation has completed a 500,000 square foot expansion program in Massachusetts and has added hundreds of new jobs to our Massachusetts payroll. With recent legislation making Massachusetts more competitive with other industrial states, we believe GCA will continue to be able to attract the topnotch talent that will stay with us over the long term.

The skilled labor force in Massachusetts is unusually good and unusually talented. There are a lot of workers who are willing to put in long hours at retraining and doing a a very, very good job. We have absolutely no problem with productivity in this state. We think it is a super group of people.

Many of us within GCA have deep roots in this area. We have given up our time to serve our communities in a number of ways through public service of one kind or another. We want to maintain the tradition of public service that dates back so far in this Commonwealth. In this way we can contribute to the maintenance of those values we all believe in.

As an international manufacturer with worldwide customers, we shall continue, of course, to expand in other areas, but I believe that our relationship with Massachusetts will continue to offer a rewarding environment to its citizens and to the industry which keep it strong and growing."

Energy

At present, Massachusetts energy costs are significantly higher than those of the country as a whole. But even while the average fuel bill here is still the fourth highest in the continental United States, massive efforts are under way to change this undesirable situation.

Our colder climate accounts for a part of the high fuel bill, but the larger portion is due to severe increases in the cost of oil since 1970. In recent years, Massachusetts has become highly dependent on oil for both heating and electricity generation. A decade ago, when we relied more on other energy sources, our fuel bills were fairly close to the national average.

To reverse this trend, we have begun a program of conservation and widespread conversion to other energy sources. As recently as 1979, there was no use of coal for utility or industrial energy needs. Since the cost of oil is so high (it costs more than twice as much per BTU as coal), a program of general reconversion offers the prospect of considerable savings. In the last three years, three large powerplants have reconverted to coal, saving electricity consumers about $265 million, and offsetting 10-12 million barrels of oil a year (out of an average consumption of 50 million barrels per year). Two more conversions like this are in different stages of planning. Several nineteenth century hydroelectric dams, the largest of which produces 15 megawatts, have been renovated and returned to operation. Work has begun on three sludge- and trash-burning power plants, the combined energy output of which will equal 12 million barrels of oil a year. One power company, responsible for a third of the state's electricity production, is following a plan that will reduce its reliance on imported oil from 80 percent to less than 10 percent by 1996.

These efforts are important because they will have the greatest impact, but they do not begin to represent the range of cost-reducing and conservation projects under way. Others that might be mentioned include a program that locates and purchases low-cost oil, which is then distributed as part of the state fuel-assistance program, and an oil-purchasing cooperative formed by city and town governments and school districts. Massachusetts is a conservation-minded society—we use less oil per capita than the national average—a trait that is an important resource in a time of rising energy costs.

The Great Stone Dam in Lawrence, built in the 19th century, has a new hydroelectric generating facility.

A trash incinerator in Pittsfield produces steam for conversion to electricity.

The Brayton Point power plant converted from oil to coal in 1981.

An aerial view shows the proximity of Logan International Airport to downtown Boston.

Transportation

Massachusetts has been building its transportation system for three centuries. While we are still adding to it—perfection is not reached overnight—the state does offer an exceptionally rich range of options to shippers and travelers.

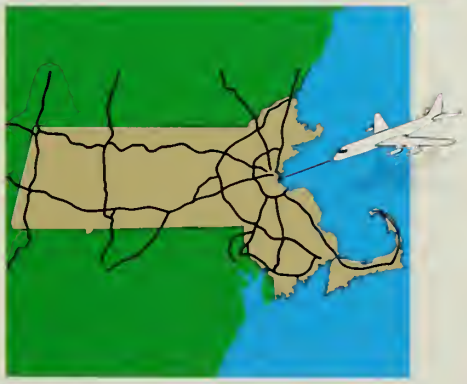
The hub of the system is Boston, site of both a full facility seaport and Logan International, one of the busiest airports in the world. (Last year, Logan shipped a half *billion* pounds of freight and served 15 million passengers.) The airport is known for its convenience, both to downtown Boston and to the interstate highway system. It is also compact and easy to navigate; shipping transfers are made in two to four hours.

Of course, there is more to the state transportation system than Boston. We have a dense, well-developed road network, as the map shows, and many regional airports. In fact, a pilot is never more than 17 miles from a paved runway. We also have 13 regional mass transit systems and a railroad system that still offers significant service to many. To extend the rail system, the state has been cooperating vigorously with private rail companies to assure continuing and improved service to key industrial rail users.

H. K. Webster Co., Inc.
Lawrence, Massachusetts
Mr. Dean Webster, President

"My company relies on rail for well over 90 percent of the feed ingredients that come into our plants, and we are really dependent on that service because the feed ingredients come from the Midwest or Canada. We've got long distances and big volumes, so it's just not practical to use trucking. And we don't have the Tennessee River flowing down through our midst, so that leaves us dependent on rail service for inbound shipments.

It looks as though we have a brighter future in rail service than we expected just a short while ago. Developments of relatively recent vintage present a prospect of at least one very strong (private) railroad system in New England that could give long-haul reliable service, hopefully, at reasonable rates. There's also some possibility that Conrail will be around, either in its present form or taken over by some of the private railroads. So, all of a sudden, we seem to see possibilities of having two long-haul railroad systems that may be economically viable."



Resources for the Future

Massachusetts has had a remarkable history as an innovative society, one from which both it and the nation have benefited. While nothing is certain, and it would be a mistake to say that having such a past guarantees a future of the same character, there are reasons for believing that Massachusetts will continue to be an innovative society. We would like to give an account of the institutions that provide the resources on which the future will be built.

A passive laser rate sensor, developed by Sperry Research Center; an alternative approach to conventional ring laser gyroscopes.

Research: an industry that mines the unknown

Research has the impact of a major industry in Massachusetts. This is due less to the direct effect of research centers on employment and investment, though that is significant, than to the many indirect consequences of the presence of an extensive research establishment. These include the training of large numbers of skilled technicians, the attraction of talent and investment, and access to skilled services and innovations.

The research industry is made up of many different kinds of organizations. One sector is composed of free-standing, independent institutions that support themselves entirely from grants and contracts. A good example of such an institution is the Charles Stark Draper Laboratory, founded "to build a bridge between science and industry." A sample of the issues Draper Labs explores includes energy, software standardization, precision instrumentation, and space and satellite systems. The nonprofit corporation earns revenues of about $100 million a year and employs about 2,000 people. It supports a wide range of educational programs in cooperation with Northeastern and MIT.

A major portion of the Massachusetts research industry is devoted to medical and biological research. Two independent research centers devoted to that area are the Marine Biological Laboratory (MBL), on Cape Cod, and the Worcester Foundation for Experimental Biology. A primary interest at MBL is the use of the physiological systems of marine creatures as a test bed for the exploration of issues of medical importance to humans. MBL scientists are also studying techniques that might prove useful in developing new protein sources through aquaculture (for example by recycling treated sewage as a nutrient source for harvestable shellfish). Research interests at the Worcester Foundation include new contraceptive techniques (the original birth control pill was invented at the Foundation)—especially male contraception—as well as cancer viruses, brain functioning, and recombinant DNA.

Whitehead Institute for Biomedical Research
Cambridge, Massachusetts
Dr. David Baltimore, Director
Nobel Laureate

"For a business person to devote a large fraction of his own personal resources to the development of a basic research institute is a rare and visionary action. Mr. Whitehead's fortune came from the application of basic research results, and he felt it appropriate to dedicate the fruits of those applications to the generation of further basic research information.

In the new Whitehead Institute, we will be pursuing the study of biological development, the process by which the newly fertilized egg divides and matures into a functioning adult organism. Our major tools will be from molecular genetics, which make it possible to isolate and study the structure and function of specific genes.

There is no better place to build such a basic research institute than the greater Boston area. The existing technical and intellectual resources of this area are without peer in the world, and thus we have an opportunity to build on the soldest of foundations."

Sperry Research Center
Sudbury, Massachusetts
Dr. Arthur J. Schneider, Staff
Vice President-General Manager

"We are here by choice. Being the corporate research center for Sperry Corporation—a company with many locations throughout the United States and throughout the world—we looked at many possible sites for the Research Center. We chose the Boston environment because we recognized that there was a skilled labor pool here and that there was a greater availability of resources for scientific research such as universities, libraries, and other laboratories. We can get to any place conveniently from Logan Airport. The quality of life offered to our employees was important—schools, recreation, cultural activities, stores, and medical facilities. All these advantages still exist today. There are many other things our people like about the area: excellent opportunities for continued professional growth, taking courses or teaching at local universities, strong professional society activities. The Massachusetts environment continues to offer much to those seeking a rewarding career in industrial research."

Like Draper Labs, both the MBL and the Worcester Foundation support extensive educational programs.

No doubt the largest part of the state's research industry is made up of university labs, centers, and institutes. While an accurate count of these organizations has proved to be impossible, there are certainly well over a hundred in the Greater Boston area alone, and possibly several times that. They come in all sizes, from laboratories with only one or two faculty members to MIT's Lincoln Lab which employees 2,000 people. Examples include the Alden Research Laboratory of Worcester Polytechnic Institute, which conducts both basic research and applied research into various issues of fluid mechanics; Boston University's Center for Polymer Studies, which supports programs that investigate the full range of issues associated with polymer materials; the Institute of Chemical Analysis at North-

eastern, which studies and refines the capabilities of analytical techniques and instruments in such fields as forensics or the detection of pollutants; the New England Enzyme Center at Tufts, which, among other work, has been undertaking large-scale biological separations for industrial and nonprofit organizations; and Harvard's Center for Earth and Planetary Physics, where the current status of the Earth's threatened ozone layer is being investigated.

A third model for the organization of research is the industrial laboratory where in-house research and development is carried on. One of several local examples of such a laboratory is the Sperry Research Center, a focal point for applied research at Sperry Corporation on such issues as data base systems and computer architecture.

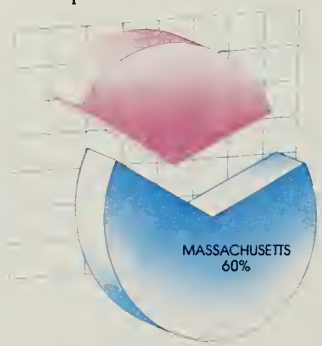
Still a fourth model of research organization is beginning to appear. While it does not yet have a generic name, it might be described as an industry/university hybrid. Two recent instances are the arrangement between the Harvard Medical School and Hoechst A.G., Harvard will conduct an independent program in molecular biology research, through the facilities of the Massachusetts General Hospital, while Hoechst, in return for a $50 million grant, will receive the right to develop whatever commercial products might appear. Similarly, industrialist Edwin Whitehead has recently given MIT the funds necessary to set up an independent laboratory in biochemistry. While the Whitehead Institute has no commercial biochemistry, it will hire its own staff who will become members of the MIT faculty. This is the first time a major university has agreed to share in the power to appoint senior academic staff. .

The central role that research will play in the state's future has recently been strengthened by a unique form of public/private collaboration. A microelectronics education and research center will be created jointly by the eight public and private engineering schools in the state, several major electronics companies, and state government. The center will be used to teach electronic engineering students about the design and manufacture of microprocessors and other devices, to update the skills of experienced engineers, and to provide joint research facilities in advanced component design for industrial clients.

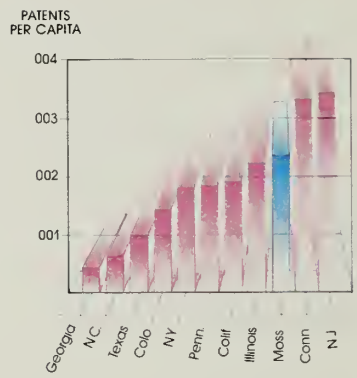
The issue of quality

There are many activities which virtually anyone can be taught to perform well. Scientific research is not one of them. Not only can few people learn to do it at all, but only a tiny handful of professional scientists ever do work that is widely useful to their colleagues. In any scientific field, the real movers and shakers can usually be counted on the fingers of one hand.

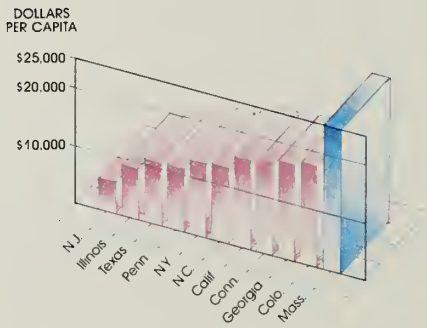
It is critical to a strong research establishment that it have a good share of this productive minority. Massachusetts does. Perhaps the clearest measure of this is that since 1965, 60 percent of all U.S. Nobel Prize winners have either trained or taught in this state. But there are other measures. Our patents-awarded-per-capita measure is high. On a per-faculty basis, Massachusetts universities attract 50 percent more federal R&D funds than Colorado, the state in second place. Each year, *Industrial Research* magazine recognizes the most innovative new ideas in industrial research; since 1968, Massachusetts has won twice as many of these awards per firm as the state in second place.



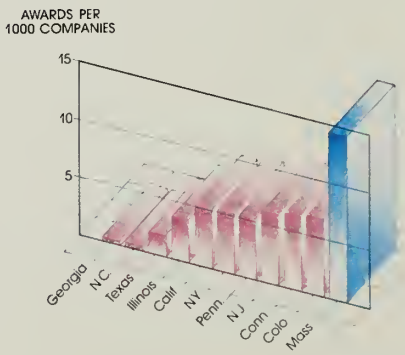
A majority of US Nobel Laureates have been affiliated with Massachusetts schools either as teachers or students.



Massachusetts residents hold a disproportionate share of the patents issued in the United States.



Faculty in Massachusetts schools receive far more research funds per capita than faculty in other states.



Massachusetts companies have won a large share of *Industrial Research* magazine's annual awards for innovation.

The talent bank

In any company, needs can appear and questions arise, often unpredictably, that can be best addressed by some external service provider. Such services might extend from a line of credit, to advice on the right management structure, to a forecast of how demand for a product might change over the next five years.

Over time, Massachusetts has built up one of the richer "talent banks" of professional and industrial expertise in the world. There are several reasons for the quality of this expertise, such as the influence of the universities, but one that should not be overlooked is the presence of a large number of knowledge-intensive companies. Such companies insist on the highest possible standard of performance; for a fast-moving company developing a new technology, answers that are not precise, accurate, and timely are worse than useless.

A prominent sector of our talent bank is the financial community. A large number of investment organizations, such as money market funds, trusts, and pension funds, are managed here, drawing on Boston's financial expertise and adding to it. Many are household words in national finance: Keystone, Putnam, Fidelity, Massachusetts Investors, and Scudder, to name a few.

Venture capital companies are especially important given the entrepreneurial character of the local economy. One, American Research and Development, helped start Digital Equipment Corporation in the 1950s. Today, DEC is one of the half-dozen largest employers in the state. There are about 40 venture capital companies in the Boston area, most specializing in high technology investments; this is more than any other state except California. A recently founded example of such a company is Eastech Associates, whose head, *G. Bickley Stevens*, describes the venture capital business this way:

"We're in the high risk business. The last six companies we have invested in have all been less than a year old. The last one was a company only on paper. The one before that was two professors from a graduate school of education with a good idea. They didn't even have a CEO, or a chief financial officer, or a vice president of marketing. But I and another venture capitalist put $750,000 into that one company.

That suggests the kinds of risks we're willing to take. What you have in the primordial mix around here is sophisticated money, money that understands the new situations and likes what it sees. In New York, the venture capital business grew up out of a money center rather than from technology. Boston is the other way around, primarily because we have a technology base here. There's a lot of money everywhere, but only around here did it really understand high technology. It's out of that base that the venture capital business around Boston grew.

I was approached by three or four people who were well known in the high-tech industry—executive VP's and people like that. What they wanted to do initially was to set up an ad hoc arrangement. What we have done is to put together a fund of $8.1 million drawn from a group of 35 high-tech executives. The idea is to pool their knowledge as well as their capital. That knowledge is really knowledge of people, products, and market areas. We feel entrepreneurs need more than just dollars, so we also provide the collective experience of our partners, which can be highly useful to new companies.

We will really only invest our time heavily if the company is located around the Boston area. Logistically this is a lot simpler, since there are more than enough deals around. Getting involved with these companies is what makes it fun."

Consulting companies, with specialized skills in everything from international marketing to new product development, have become a major feature of the business scene in the last 20 years. There are upwards of 75 such firms in Massachusetts, some very well known. DRI, for instance, has in a few years become a leading producer of economic forecasting models widely used by business and government to gauge future economic trends. The original management consulting firm, Arthur D. Little, headquartered in Cambridge, was established in 1868. ADL conducts studies on issues that range from corporate planning and market forecasts to health care planning. It has founded its own management education institute which offers an accredited graduate program in management. The President of ADL, *John Magee*, describes the relation between his ability to assure a high level of service and the quality of the region in the following way:

"Massachusetts is not the place to look for natural resources. But it has a quality of human and financial resources that should not be overlooked—its traditional commitment to the spirit of innovation. Since the days of the clipper ships and the whaling industry, the Massachusetts business and financial community has backed innovation.

Today, Massachusetts is a center of venture capital development. I think we've just begun this process of backing innovation. Generation after generation, there have been those who've said: 'We've discovered everything.' Can we really say now that technical innovation has come to an end? On the contrary, the quality of innovation and the capacity to support innovation through human resources have become increasingly important in today's world. We see this trend not only here in the United States but in other parts of the world. In that sense, I'm optimistic about what can happen in Massachusetts.

Although we're now scattered in far parts of the world with offices and laboratories in several places in the

United States and abroad, this is the emotional home of Arthur D. Little. Cambridge remains our principal base, the home of a substantial part of the staff. Our principal research and development laboratories are located here. I think it has been a good place for us, importantly because of the diverse quality of life in the community. It's an area where people can find their own opportunities. They can live in the style that they prefer and find the communities of interest they want to develop.

The Commonwealth's academic community has been a strong support to the development of our company. The colleges and universities in the community undertake to make themselves very accessible. It is a tradition at Arthur D. Little to work closely with members of the principal universities; their faculties provide specialists who can add the particular knowledge an assignment may require.❞

The reason most frequently cited by new companies for establishing themselves in Massachusetts is the direct access to the expertise of faculty at our universities. A measure of the depth of this resource is the approximately 15,000 graduate faculty found in the Greater Boston area alone. While not all of these faculty members consult with business, many do; among them, virtually every business need is addressed. Universities are valued by businesses for other reasons as well. *Dr. Kenneth Ryder,* the president of the largest private university in the country, Northeastern, describes some of the character of this relationship:

❝Through Northeastern's extensive cooperative plan, we have become partners with industry and the business community in this area in both the employment of and the education of our students. We have a staff of about a hundred professional people working on continued placement of students on a day-to-day basis with personnel officers and business leaders in new and emerging businesses. As we explore with them what role Northeastern students might play in their organizations, we also become informed about changes in their businesses and skill shortages that may be developing. In the same fashion, with our 35,000 part-time adult students, the great bulk of whom are already employed, we have another series of ties to business and industry. Not only do we upgrade their skills, but we also bring to the course instruction a practical orientation because the part-time program involves the use of a large adjunct faculty who are employed during the day in industry. One by-product of all of this is a system of non-credit state-of-the-art courses, many of them in plant, that react to very clearly identified technical and professional needs of industry. In this region, we have also dominated the part-time engineering programs at the graduate level. The availability of such courses has been a great advantage to industry in encouraging the upgrading of existing employees. Similarly, our MBA program has become an extremely attractive way of providing upward mobility for retraining engineers who now have management responsibility.

This pattern of interaction between the employment community and the educational world is characteristic of a change in attitude among the majority of local universities which creates a good climate for industrial development.❞

The many architectural landmarks which grace our cities have played a part in attracting some of the world's leading architects, names like Graham Gund, Hugh Stubbins, Moshe Safdie, and The Architects Collaborative. The talent bank includes not only these architects and designers, but engineers and builders as well. Nine of the 25 largest engineering firms have offices in Massachusetts. Some of the reasons why engineering flourishes here are explained by *George Tozer*, the president of Metcalf & Eddy, a major civil engineering firm headquartered in Boston:

❝Metcalf & Eddy was founded in Boston in 1907, so we are celebrating our 75th anniversary as a Massachusetts firm. We have firm roots in Boston and are proud of our heritage.

Our ties to Massachusetts colleges and universities go deep; Mr. Metcalf attended Worcester Polytechnical Institute and Mr. Eddy went to MIT. Today, Metcalf & Eddy has a staff of over 700 persons working on civil, environmental, and industrial projects out of 15 offices worldwide. But our roots and much of our business remain here in Boston. And the engineers, draftsmen, and designers who come out of the local schools are our backbone.

As a consulting firm, we rely upon those people, and the quality of talent we find in Massachusetts is outstanding. Since we are located in Boston, our people are also able to continue their education, studying for graduate engineering degrees, MBAs, and so on at such places as Northeastern University and Boston University.

We're a young person's company. Probably 30 to 40 percent of our people are five to six years out of college. We find that the young people enjoy the greater Boston area. They really take advantage of the skiing to the north in winter, the beaches in the summer, the trails and forests for climbing and hiking, and the city itself. In fact, we sometimes find it difficult to encourage our people to transfer to our other offices, even though they are in good locations such as San Francisco, Houston, Chicago, New York, and even Honolulu. They'd rather be in Boston.❞

Public sector contributions: a partnership in enterprise

At its best, the relationship between the private and public sector is a partnership. This was the case, for instance, during the development of the rail, automobile, and air transportation systems. In each case, government helped establish the necessary infrastructure—for railway rights-of-way to be acquired and for highways and airports to be built.

In the case of Massachusetts, this partnership began shortly after the end of the Revolutionary War when the state pioneered in several innovative forms of the corporate charter: making a partial grant of government powers to private corporations in order to achieve some public purpose (such as canal construction). This partnership continues today, though under radically changed conditions. One of the needs of growing companies—especially these days—is access to capital. In response, the state has formed a number of economic financing programs to assist businesses expanding or locating in Massachusetts.

The largest of these programs is the Massachusetts Industrial Finance Agency (MIFA). In the three years since its creation, MIFA has issued well over $1 billion in industrial revenue bonds to over 1000 companies. In 1980, over half the new industrial space built in the state was financed with MIFA bonds. Half of that capital went to small companies. MIFA also provides mortgage loan insurance, gives tax-exempt financing for pollution control equipment, and offers many special financing vehicles to businesses participating in a commercial area revitalization program in older downtown areas. Over a hundred loans have been made to companies involved in such programs.

The state has also established a venture capital company—the Massachusetts Technology Development Corporation. Acting in cooperation with syndicates of private investors, the MTDC has leveraged about $11 million in private funds, while investing $1.5 million of its own, to help finance new technologies.

Acting toward the same end, the state has chartered two private corporations to extend financial assistance to companies unable to borrow from more established sources. One is the Massachusetts Capital Resource Company. This is an investment partnership formed by nine Massachusetts life insurance companies. The MCRC provides growth capital; makes subordinated and senior, unsecured, long-term loans; and works with other lenders and creditors in order to help high-risk Massachusetts manufacturing and industrial operations survive and grow. To date, over $70 million has been invested in 63 companies.

The development of this flight simulator, made by Pacer Systems, Inc., of Burlington, was financed in part by MTDC and MBDC.

Massachusetts Mutual Life Insurance Company
Springfield, Massachusetts
Mr. James R. Martin, Chairman

"We have taken a 180-degree turn in Massachusetts. The most important evidence of this has been a change in attitude. The leadership in our state government today—both the executive and legislative branches—fully understand and appreciate the importance of a healthy private sector economy and the need to create and save jobs.

An example of how this public-private partnership has worked is the Massachusetts Capital Resource Company. As part of a domestic life insurance tax reform package, the Massachusetts-based life companies created a $100 million fund to be invested in Massachusetts companies with the objective of creating or saving at least 2,000 jobs. The loans are made to companies that cannot get the same funds through normal investment channels. To date, this fund has invested over $76 million in our state's economy and has created or preserved over 6,000 jobs. It has worked extremely well. We have already more than tripled the original goals and feel that by the time we get the balance of the money invested, over 8,000 jobs will have been created or saved. The idea for this fund was initiated by government leaders who approached us for help. From then on, it was a true partnership approach to the job of economic development."

The second state-chartered corporation is the Massachusetts Business Development Corporation. MBDC loans are usually in a secondary position to borrowers unable to obtain funds from usual financial institutions. In the 29 years of its existence, it has placed almost $100 million in loans to companies with total payrolls of half a billion dollars.

Another area in which a partnership between public and private enterprise has proved beneficial is the redevelopment of surplus government property for private use. The Massachusetts Government Land Bank works with cities, towns, and other organizations on land acquisition, site development, and construction and rehabilitation projects that serve a clear public purpose (such as job creation), but which have been unable to attract sufficient private sector financial support.

Other examples of the exercise of this partnership include:

- The Massachusetts Health and Education Facilities Authority. Over the last decade, this agency has provided almost $1 billion through revenue bonds to private higher education institutions, hospitals, and health centers. While these funds are not of direct service to industry, they support the development of the resources important to the state's economy.
- Special legislation allowing communities to negotiate tax arrangements with developers. To date, construction worth approximately $500 million in commercial and industrial development has been facilitated by this legislation.
- A Massachusetts export sales tax exemption. Export sales of tangible personal property are not included in sales for tax purposes.
- A 3 percent investment tax credit. This is a 3 percent credit against state excise tax liability on the cost of depreciable real and tangible property used and situated in Massachusetts.
- A sales tax exemption for machinery primarily engaged in research and development.

(Right) The Prudential Center, dedicated in 1965, was the first project constructed under the Chapter 121A tax incentive program.

(Below left) An addition to the Goldfarb Library at Brandeis University, Waltham, was supported by a bond issue from the Massachusetts Health and Education Facilities Authority.

(Below right) The construction of a new plant in Fall River by the Industrial Products Division of Phalo Corporation was financed by the issue of Industrial Revenue Bonds and a loan guarantee from MIFA.

Recycling the urban environment

The resources from which Massachusetts is shaping the future include not only the human and institutional strengths mentioned, but our existing urban environment. Adapting old buildings to purposes never imagined by their original designers takes special skills, in financing no less than design and construction. Massachusetts is one of the few places in the country that has these skills and makes a good business out of recycling its urban building stock on a large scale. In Boston alone, approximately 2 million square feet of office space have been created by recycling in the last three years. Yet all this is taking place alongside a major boom in new commercial and industrial construction as well. The result has been that rarest of achievements—true urban renewal, accomplished by capitalizing equally on the strengths of the old and the new.

Boston new and old

Boston may not be the hub of the universe, as old Bostonians fondly thought, but it is certainly the hub of the New England region—half the population of the state lives in the Greater Boston area. And these days, the hub is spinning. Boston is in the middle of a real estate development boom that is historic by any standards. Projects now opening, under way, or on the boards will double Boston's office space in less than a decade and increase the number of hotel rooms by 50 percent. New building investment is running at $1 billion annually.

An important element in the recycling of the urban environment is the adaptive reuse of old buildings for new industrial, commercial, and residential purposes. Some recent examples include:

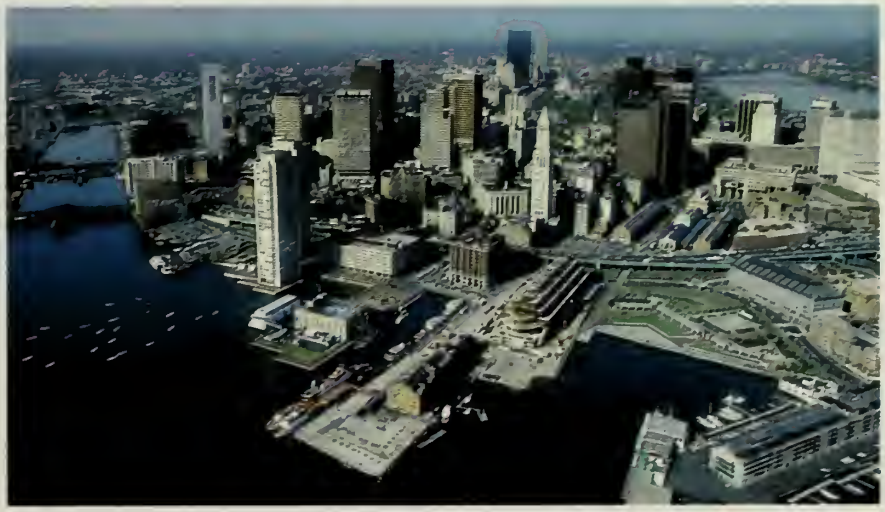
The Charlestown Navy Yard

The Navy yard was built in 1800 and decommissioned by the U.S. Navy in 1974. Many of its buildings were raised in the first half of the nineteenth century, as the U.S. Navy was expanded. These buildings are being retained and converted into one million square feet of office and light manufacturing space. When completed, the 105-acre project will also include a marina; a major waterfront park; and 1,200 apartments and townhouse units located in the city, on the waterfront, with a sweeping view of the harbor.

The Charlestown Navy Yard is being recycled for residential and commercial use.

The Waterfront

The best-known examples of recycling—perhaps in the country—are found on the waterfront. Here, the extensive warehouse and wholesaling complex originally built in the nineteenth century around the port has been converted into retail space, offices, restaurants, living spaces, and other commercial uses. The Quincy Market restoration is especially notable, but there have been dozens of other, less well-known projects, ranging from the conversion of some industrial coal storage bins by the city into a fire station, to that of the original Prince spaghetti factory into residential condominiums.



The Boston waterfront--new and old

The Boston Marine Industrial Park

The BMIP was part of the Boston Naval Annex, a major wartime staging area, and is now the city's prime site for new waterfront industrial development. It is a 102-acre deep-water site, at the head of the Boston Harbor Channel, with rail and truck access and 1.2 million square feet of total leasable space. Special features include the longest public dry dock on the East Coast and a technical center for the training of prospective employees.

The Crosstown Industrial Park

The Crosstown Park is an example of the creation of new industrial space in Boston. It is a 38-acre parcel, sitting at the intersection of two major state highways. One of the first tenants to buy into the advantages of an urban industrial park was Digital Equipment Corporation.

The Boston Marine Industrial Park

The Crosstown Industrial Park houses one of Digital Equipment Corporation's new manufacturing facilities.

Teradyne, Inc.
Boston, Massachusetts
Mr. Alex d'Arbeloff, President

"When we started the company, all our people were in downtown Boston. Now that we have something over 3,000 people, about 50 percent still work in downtown Boston. While the downtown location has some disadvantages, it also has its advantages. One is that we are able to recruit from north, south, and west of Boston. We're probably the only high technology company in Massachusetts with employees who live in New Hampshire and Rhode Island working at the same location. Another advantage is the proximity to Logan Airport. Most of our customers are located at great distances from Teradyne—many of them in Europe and Asia. So convenient air transportation is a big plus. Then, of course, we're close to good hotels, restaurants, shopping, and just two blocks from the Mass. Turnpike.

Our downtown location also gives us a large contingent of workers who commute by public transportation, which, again, is unusual for high technology industry. We also have a much higher percentage of minorities—17 percent—than the average high-tech company—not because we necessarily do anything special, but because we happen to be in a downtown location. The key issue for us is people, getting the kind of skilled help we need. Let's face it: the people who are the hardest to get are engineers and other technical talent. There are two ways you can get them: you make it attractive for people to move into this area, or you can educate the people who are already here. We try to do both."

Historic cities made new

Recycling may be found on a grand scale in Boston, but it is nearly as important, proportionately, in other areas of the state. Here are four Massachusetts communities that have recently renovated nineteenth century industrial areas: Lowell, where the industrial production of cotton textiles began in the United States; New Bedford, best known as a nineteenth century whaling port; Springfield, "the city in the country," an industrial and agricultural center in the Connecticut River Valley; and North Adams, an industrial community in the Berkshire Mountains (in Western Massachusetts).

Lowell

Lowell, one of the original mill cities, has recently emerged from its second phase of recycling. Its building stock was originally constructed in the 1850s to support the textile industry. Then it was recycled once after the Great Depression to a mixture of industrial uses. Finally, over the last 10 years, the city's downtown has been renovated a third time, fulfilling a policy of "balanced reuse": some industrial purposes, combined with residential, retail, office, and commercial uses. Lowell created the first "Urban Heritage" state park as a focal point for its downtown renewal.

Lowell Museum, in a recycled mill, part of the Urban Heritage Park.

Polish Festival

Greater Lowell Community Boat Club, on the Merrimack River.

New Bedford

Unlike many East Coast ports that have abandoned their maritime heritage, New Bedford continues to make its living from the sea. Its fishing fleet is the largest on the East Coast and catches one of the largest harvests of any port in the country. Its building recycling plans have reflected that fact. New Bedford has recycled its harbor structures so as to serve traditional functions in modern fashion. All seven of the city's major wharves have been rebuilt in the last few years, creating, in the process, 15 new acres of industrial space by the construction of bulkheads.

Fishing fleet, New Bedford Harbor

Scenes of New Bedford's recycled waterfront area.

Springfield

"The city in the country" was recently cited by *American Banker* as being a model of private sector involvement in urban renovation and recycling. Of the 19 most significant renewal projects undertaken in the last two years, 13 involved the renovation of old structures. Among other uses, these renovations will place almost a thousand living units on the market in the center of the downtown renewal.

Springfield Civic Center.

The Quadrangle: the cultural center of Springfield.

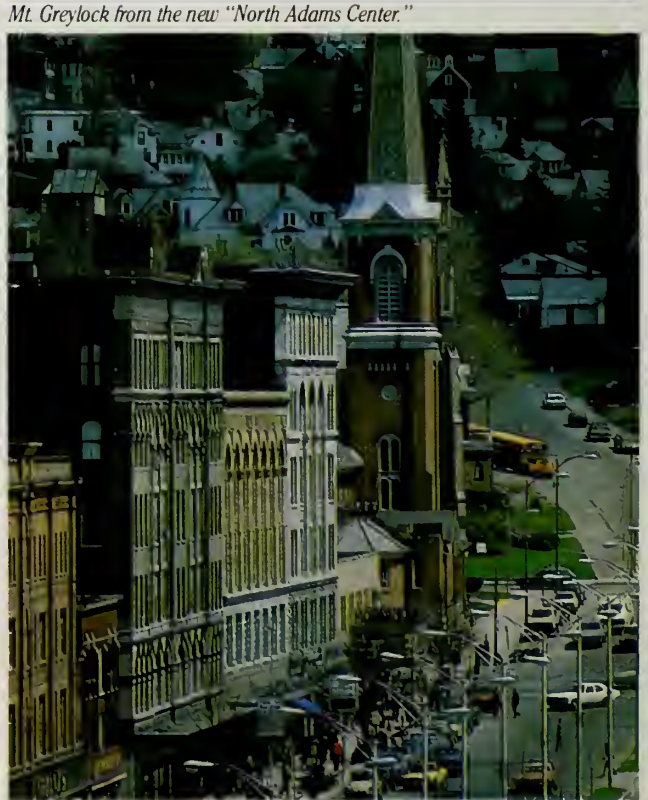
The Valley Bank Tower, part of the downtown renewal area.

Connecticut Valley Historical Museum.

North Adams

This community, set in the Berkshires and one of the state's most scenic areas, has undertaken a number of recycling projects. One involves adapting some railway storage buildings including coal and grain storage facilities into a retail, tourist, and cultural "Urban Heritage" state park. North Adams has recently renovated a major section of its downtown, restoring it to its nineteenth century appearance. The downtown section appears on the National Register of Historic Places.

Mt. Greylock from the new "North Adams Center."



North Adams' restored nineteenth century downtown.

A Look at the Future

What will the future economy of Massachusetts look like? Barring some unanticipated discovery of natural riches under our soil, the economy will continue to be based on its historical foundations: on the human resources of skill, imagination, and enterprise, and on new businesses, based on new ideas, and growing into industries.

Precisely what that might mean is a harder question to answer. But we can get an idea by looking at some new companies, some new industries, and two recent industrial success stories.

A researcher at Digital Equipment Corporation's Hudson plant examines a silicon wafer to be used in the manufacture of microchips.

Seeds of the Future: New Enterprises

Interactive Images, Inc.
Burlington, Massachusetts
Dr. Leonard I. Hafetz, President

The computer industry in the 1980s is becoming increasingly focused on software development. The capacities of the hardware—the terminals, displays, memory banks, printers and so forth—are becoming so sophisticated that their full potentials can be fully utilized only by a small group of specialized programmers. Yet the number of potential users of computers—people whose jobs could be greatly facilitated by them—is growing exponentially. Software, which includes the ability of people to interact with the computer, has thus become a focal point for development in the computer industry—the touchstone in making computers "user friendly."

Interactive Images, Inc., is a brand new company on the very leading edge of this development. Founded in October 1981, it seeks to develop under a patent and royalty arrangement with MIT a line of computer products and terminals that not only enable nonprogrammers to use computer-based information systems, but also have the power to improve the efficiency of trained programmers. Interactive Images' initial products will reduce the difficulty of human/computer communications through the use of visual images shown on the video screen. Combined with text and graphics into "Keypages," the images become the primary means of communication between the computer and the user. The user accomplishes this communication simply by touching a picture representing the desired operation as it is displayed on the screen.

As with many new products, the ultimate test of market profitability is yet to be met. Interactive Images, Inc. president, Dr. Leonard Hafetz, is no neophyte to high technology start-ups (having been involved in two previous ones), and he is optimistic about the potential for his company. At the moment, the company employs about 10 people. If it is to grow, many more people with expertise in programming, marketing, finance, and other areas will have to be recruited. Being in Massachusetts makes this possible, in Dr. Hafetz's view:

"Given the atmosphere in Massachusetts, I can't think of a better place to be for me, and that even includes Silicon Valley. The talent is all here, the schools are the best, the attitudes are really energetic and northeastern. It's a tough world and tough Yankee business, and that's what I like to be involved in. I like quick wits. I like people who are sharp. I'm interested in this kind of environment. I think this is what forces you to get very good.

There are very few institutions that I know of that can spin off things the way MIT has equipped itself to do. Initially, the area attracts the best people. But the people from Harvard and MIT want to stay here. For me, with an R&D start-up situation, that becomes very important in running a company. I don't have to go traveling to find a smart person who knows computers and knows the industry, but I can call up a recruiter and get 30 people's names on my desk tomorrow, and all they have to do is take a bus to get here. There's a lot of talent here and because it's a desirable place to live, they stay here.

I don't think this is something that goes away easily. The existing momentum is enormous. Masses of people won't get up tomorrow and go to California and vice versa. This kind of an attitude takes a very long time to run down, and then only after a lot of neglect—and there is anything but neglect at places like Harvard and MIT."

Damon Biotech, Inc.
Needham Heights, Massachusetts
Dr. David I. Kosowsky, President

In 1981, Damon Corporation—long a leading firm in the industrial biomedical community—announced the formation of Damon Biotech, a new subsidiary aimed at participation in the rapidly emerging biotechnology field. Damon Biotech was created to fuse academia and industry by incorporating a multidisciplinary group of prominent scientific researchers with Damon's existing base of management, proprietary technologies, and production capabilities. Founders of the new firm included distinguished scientists from MIT and Harvard Medical School, who serve on a Scientific Advisory Board headed by Dr. Irving M. London. Dr. Jerome Wiesner, President Emeritus of MIT, acts as an advisor to the company.

Damon Biotech benefited directly from the biotechnological research and development conducted by its parent corporation over the past seven years. Thus, unlike most biotechnology companies, it has already introduced products based on its proprietary technology for microencapsulating living cells and biological materials.

The microencapsulation system, called ENCAPCEL,™ permits economical production of monoclonal antibodies by eliminating the need for laboratory mice in the production process. Monoclonal antibodies are key to much of the new genetic technology, and are used extensively in the purification of vaccines, drugs, and synthesized interferon. The new process will also permit the first practical production of human monoclonal antibodies for cancer testing and treatment.

There are numerous other applications for ENCAPCEL that Damon Biotech is developing. In treating diabetes, it may be possible to encapsulate pancreatic cells and inject them into the patient as a source of "naturally-produced" insulin within the body. For improving various types of long-term pharmaceutical treatment, ENCAPCEL could be used for sustained and targeted release of drugs. Industries such as food or beverage processing might also put ENCAPCEL to work for fermentation and other chemical engineering uses.

Damon Biotech has benefited from close associations with the medical and university communities in Massachusetts. Dr. David Kosowsky, president of Damon and Damon Biotech, reflects on the impact of this association:

"It is not an accident that our major national efforts in modern biotechnology have originated around the principal university centers. My affiliations with several Boston teaching hospitals, for example, have helped to shape my own thinking about the role of industry in biotechnology."

Genetics Institute
Boston, Massachusetts
Dr. Gabriel Schmergel, President

The scientific founders of Genetics Institute, an independent privately held firm, are Professor Mark Ptashne, chairman of the Department of Biochemistry and Molecular Biology at Harvard University, and Professor Thomas Maniatis, also from Harvard. Several prominent venture capital firms and individuals have provided the initial seed capital for the company. Professors Ptashne and Maniatis remain on the faculty at Harvard but serve on the Scientific Advisory Board of Genetics Institute on a part-time basis.

Most of the day-to-day direction and management of Genetics Institute is provided by Gabriel Schmergel, the current president, who came to the Institute in June 1981 as research operations were beginning. He describes the Boston area as "ideal" for a firm such as Genetics Institute.

"The key element in our business is people. The universities and the great teaching hospitals in this area have the senior people, many of whom are interested in being consultants or joining on a full-time basis as senior scientists on our staff. Furthermore, these institutions graduate many young people through their various levels of training, and they prefer to remain here. These scientists and research technicians want to live in a community with a great deal of culture, a great deal of professional stimulation. Being here, we have not had any problem recruiting and we have not had any problem bringing people here, even from California."

In its first operational year, the Institute has grown from a staff of five to over 40 employees and into a 16,000 square foot laboratory in Boston adjacent to the Harvard Medical School complex. Research is being conducted on the development of new biotechnical products and processes for health care, agriculture, and industry. To accommodate the expected growth, a specially designed site, with pilot plant production capability and over 40,000 square feet of space, will be ready in late 1983. The new site will accommodate a staff of 150 employees. Mr. Schmergel comments:

"We aim to make Massachusetts our permanent location. Maybe in Boston or Cambridge or elsewhere in the state, but our main research facility and our administrative headquarters will be here. We will expand and grow and build upon the successes that we foresee."

Elscint, Inc.
Boston, Massachusetts
Mr. Henry Keller, President

Elscint—the name is a contraction of "electronic" and "scientific"—was founded in Israel in 1969 to make electronic measurement instruments for nuclear research. In the past six years, Elscint has attracted international attention in the dynamic field of medical diagnosis with its sophisticated line of CAT scanners, gamma ray cameras, and ultrasonic diagnostic instruments—effectively competing with far larger companies. Nowhere has their success been more apparent than in the United States, says Dr. Avraham Suhami, chairman: "Increasingly, we are thinking of ourselves as an American company based in Israel."

Elscint's North American headquarters was established in Brookline, Massachusetts, in 1981, near the Harvard Medical Area complex when Elscint acquired the Cambridge Advanced Research Laboratories. Mr. Henry Keller, president of Elscint, North America, observes: "The infrastructure in Massachusetts and especially in the Boston area is excellent for high technology electronics firms. The basis of skilled engineers, both at the university level and in commercial enterprise in the many companies in the Boston area, makes it quite convenient to draw upon talent. In addition, our business is highly affiliated with developments at universities and, as we all know, the Boston area has more than its fair share of excellent medical institutions—both at the university and college levels. And, of course, there are independent hospitals not necessarily affiliated with universities which make up the backbone of the large commercial health care base."

Keller notes that this high technology infrastructure is important in all phases of product development: "When you design a product, you have to take into account that the product must have technological impact, so input from university teaching centers is quite important. But after it's designed, you're hoping that a large base of users will be able to use it effectively and cost efficiently. And that means that having affiliation with the smaller and intermediate size hospitals—to have them be able to afford it, understand it, to be able to use it effectively—is also very important in the marketing decision. And, of course, Massachusetts provides the full spectrum of all potential users in a very concentrated geographical area."

Elscint occupies a 60-year-old structure on the Boston-Brookline line. The building was extensively renovated with funding assistance provided by the Commonwealth. In its first year of operation in this building, Elscint's ultrasound division grew to over 100 employees engaged in development, engineering, manufacturing, and marketing. The total corporate operation grew in this period from five to 180 people.

BBN Information Management Corporation
Cambridge, Massachusetts
Dr. John McQuillan, President

BBN Information Management Corporation is a newly formed subsidiary of Bolt Beranek and Newman, Inc. BBN, the parent, is a major factor in consulting, research, and development in computer applications and acoustics. In March 1980, the subsidiary was established to exploit the software technology BBN had developed over many years in major projects such as ARPANET—a huge worldwide network of individuals and organizations involved with ARPA, the Defense Department research agency.

The career of the subsidiary's president, Dr. John McQuillan, mirrors both the company's inception and a typical pattern of university-business interaction in Massachusetts. McQuillan began his computer work at Harvard as an undergraduate. As he moved on to Harvard graduate school and began to search for a dissertation topic, he found people at BBN engaged in the kind of network design work he wanted to pursue. His doctoral research arose from his job at BBN designing much of the ARPANET software. In time, the importance of networking design led to the creation of a separate group within BBN to provide consulting services to clients in this area. The next step was to create a separate company to develop wider commercial applications of the knowledge. So BBN Information Management grew both out of John McQuillan's own career and out of the parent company's long-time leadership in this field.

InfoMail, BBN Information Management Corporation's major product, was introduced to the market in January 1981 and is

a highly sophisticated, flexible electronic mail software product that runs on a great variety of computers and operating systems and communicates among computers using existing terminals and networks. It is an adaptable system, suitable for high-level management use as well as word processing. Its market niche is related to its adaptability to many different kinds of hardware and its simplicity of use, requiring virtually no training. Initial market reaction has been very favorable.

"You have to have used an electronic message system and really thought about the automated office in order to be able to do the networking effectively, and not too many people have done that. I wouldn't think of launching this venture except in an area with a very high concentration of computers and a very high concentration of people who have a good feeling for the future of this industry. It's not like Chicago or other places where there's a big concentration of money and organizational strength, but where things are simply not moving forward as rapidly; the Midwest is just a more traditional place. If you look at the whole office automation idea, it's really a very big step forward technologically. To be able to do it successfully requires both the university environment and the venture capital part of it—the business conditions and the steady stream of capital coming in. Going right from research to consulting to products, Cambridge and Massachusetts are really good places to be. I feel that very strongly. I wouldn't want to move our organization from this area.

In Boston, there are dozens of well-respected consulting companies of all kinds that are forming new companies, doing new things, and developing new products. They all know that creating new industries is difficult but that it can be done—in fact, it should be done and now is the time. It takes people with imagination and guts as well as brains. I think one of the other places where America really leads the world is in that venturing spirit. You don't see that in Japan. I think that's really at the heart of the resurgence in Massachusetts."

Biogen, Inc.
Cambridge, Massachusetts
Mr. Mark Skaletsky, President

Biogen was founded in 1978 by an international group of scientists and businessmen to commercialize major advances made in molecular biology in the 1970's. Biogen has since become one of the leading firms working in the rapidly growing field of biotechnology. After establishing its international headquarters in Geneva, Switzerland, Biogen established an operating subsidiary in the United States, choosing Cambridge, Massachusetts, as its home. Biogen has recently opened a 67,000 square foot facility in the Cambridge Center development. Mark Skaletsky, President of Biogen, Inc., observes:

"The selection of Massachusetts as the site for Biogen's U.S. subsidiary was a carefully considered decision. Biotechnology is a dynamic industry, constantly advancing into new areas. Biogen, for example, grew from three to 250 employees in three years. We needed a location that would have an available pool of talent, that would be attractive to employees and that would have the sophisticated financial and business services that we require. The Boston area met these requirements with its large number of academic and research organizations and the support systems in place to serve the concentration of high tech businesses."

Biogen's initial efforts were focused on research in pharmaceuticals, where many important human proteins and virus-free vaccines were available only in limited quantities and at great cost. Using the techniques of recombinant DNA, advanced genetic mutation, and monoclonal antibodies, work progressed rapidly. In 1971, Biogen was the first company to announce the synthesis of Hepatitis B virus protein antigens (potential components of a vaccine against the human virus that causes serum hepatitis); in 1980, they were first to announce the synthesis of biologically active human leukocyte; and, in 1981, the first to announce synthesis of a protein antigen of hoof-and-mouth disease.

Other research efforts have focused on human vaccines, where biotechnological techniques offer the promise of making certain vaccines which cannot be produced by traditional methods or in economical quantities. Biogen also continues to pursue research projects in the areas of blood factors, hormones and other human proteins.

"The growth of our industry has attracted a great deal of public attention. But like any business, the primary ingredient is people. For us, that means scientists and managers with a view towards the future; people excited by the potential of our work and the flexibility to adapt to a rapidly changing environment. If there is any overriding reason why we located in Massachusetts, it is the availability of the type of people we need and the lifestyle to keep them here."

New industries take the stage

Industries riding the wave of new technologies have largely defined Massachusetts economic history, from cotton and firearms to the manufacture of CAD/CAM machinery. What industries might play this role in the future? While it is impossible to answer this question definitively, when enough companies have been established in an area we can begin to see the outlines of a new industry. Two examples are biomedicine and software.

Biomedicine

Biomedicine refers to the entire range of industrial support given health care and medicine, including the manufacture of the equipment and the production of the substances used in basic and applied research and the monitoring, diagnosis, and treatment of diseases and health hazards. Massachusetts has always had a few companies involved in this area, and a number of those companies are decades old. But two recent developments have transformed what was once a comparatively small and quiet sector into a true innovative industry. The first was the discovery of biotechnology and its techniques—the fabrication of "living tools." While breeders have been shaping plants and animals to meet human needs for millenia, until recently their choices were restricted by the flow of natural mutations. In the last six years, new breakthroughs in genetic research have made it possible to engineer microorganisms (usually bacteria and yeast) to produce a wide range of useful substances.

The second development is the growing importance of controlling the rising costs of health care. The portion of the nation's GNP going to medical care has doubled in the last decade. Yet our population is aging, and our need for medical care will, if anything, expand. In this context, the need to find new ways to control costs has begun to change and to renew the biomedical industry. The new emphasis on cost control affects every stage of health care. In diagnosis, new technologies allow physicians to detect health-threatening conditions earlier, which often permit cheaper, more effective therapy. In many cases, these improvements themselves replace more expensive diagnostic methods, such as exploratory surgery. During surgery, new blood management techniques, allowing the reuse of a patient's blood, can make a dramatic difference in plasma costs. And new drug production methods can lower the cost of many drug therapies, while better drug transport systems make administration more efficient.

Instrumentation Laboratory's Multistat® III Plus Systems performs some 100 automated clinical chemistry analyses on patient samples in hospital laboratories.

New England Nuclear
Boston, Massachusetts
Dr. Marvin Stolberg, President

"New England Nuclear began operations in the South End of Boston in 1956. Our original rented loft space has grown to six sites employing 1600 people in Massachusetts. Although today our sales are over $100 million, nearly 90 percent of NEN's employees and all of our manufacturing sites are still in Massachusetts.

New England Nuclear is the world's leading manufacturer of both radioactive chemicals for research and radiopharmaceuticals for medical diagnosis. We're also a major supplier of products for biotechnology research. Certain NEN products, for example, help physicians diagnose serious diseases like cancer, stroke, and emphysema. Thallium-201, which we introduced in 1977, is one of the most valuable means by which heart disease can be detected. Other NEN products are used by biomedical researchers around the world to learn more about disease so that new treatments can be developed. We also have our own research program, in which our scientists are studying ways that antibodies can be used in improved diagnostic tests and, hopefully, in the treatment of serious disease.

One reason why NEN has stayed in Massachusetts is that we've been able to attract the talented people we need. We know that Massachusetts has a high cost of living—and we're concerned about it—but we also know that the state is attractive to people interested in science and culture. I'm not a native, but I've lived in Massachusetts for 27 years, and I like it very much. I believe most NEN employees feel the same way."

Haemonetics Corporation
Braintree, Massachusetts
Mr. Allen Latham, Chairman

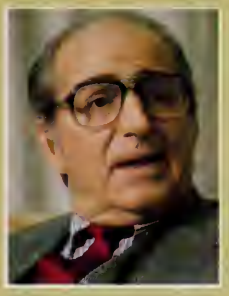
"Twenty-five years ago, Dr. Edwin Cohn of the Harvard Medical School developed an approach to blood therapy that focused on the use of blood components not just whole blood. By separating the blood into components, it is possible to serve more patients with the same amount of blood as well as avoid overloading patients with transfusions of blood components they do not require. Dr. Cohn approached the Arthur D. Little Company for assistance in commercial development, and I was assigned to the project. The result was the ADL-Cohn blood fractionator, a centrifuge-based device that was the forerunner of our current product line. Ten years ago, I founded Haemonetics because I believed the development of this technology would be of enormous benefit to people everywhere. Dr. Cohn's technology is still in use, although we have grown rapidly by developing additional blood separation and processing techniques. Today, Haemonetics makes blood-processing systems and related disposable items used for the collection of blood components for transfusion, for the therapeutic removal of blood components from patients, and for the salvage of blood that would otherwise be lost during surgery.

I suppose that Haemonetics could have happened someplace else, but I think the fact that Harvard Medical School, New England Deaconess Hospital, and A. D. Little were all in the Boston area is significant, as is the fact that the centers of learning are very accessible here. We have worked closely with all of them over the years."

Instrumentation Laboratory Inc.
Lexington, Massachusetts
Mr. Thomas Rosse, President

"It's the people who make our business—bright, hardworking men and women who make our company go, and the Boston area supplies them. Boston offers numerous colleges and universities, hospitals and medical schools for cooperation in our advanced development, as well as experimentation and evaluation of our new concepts and products. We have a lot of MIT people here, as well as a very active cooperative program with Northeastern University, and a program with Worcester Polytech.

For me, and I am sure for a lot of IL people, our four seasons are appealing. The mountains to the north for convenient skiing in the winter and Cape Cod and the islands for memorable summer vacations are part of the attraction of this area. Boston is a relatively small city with cultural and educational opportunities equivalent to or better than those of most large cities in the world."



Collaborative Research, Inc.
Lexington, Massachusetts
Dr. Orrie M. Friedman, Chairman

"We are one of the oldest biotechnology companies. We were doing biotechnology long before it was even known as such, and so we have developed a much broader technological base than most companies—in DNA research; in gene synthesis; in DNA biochemistry and gene enzymology; and in cell biology, particularly tissue culture technology. We recently announced the successful synthesis of rennin, a critical enzyme in the production of fine cheeses which has not been adequately available from natural sources. This is an industrial product with potential commercial development in only two or three years, rather than the 10 years or so required for most pharmaceutical and medical products.

The reason for our success here is attributable in no small measure to our ability to tap into the most distinguished and creative scientists in biomedicine. In fact, our scientific advisory board is made up of four world-class scientists, including David Baltimore, a Nobel Laureate. Among the others is the former director of the Huntington Laboratories at Mass General, one of the most distinguished laboratories in the country. When I began the company, I was aware of what had happened in the electronics business—a spin-off of the academic talents in MIT and Harvard. I thought a comparable phenomenon was going to occur in what we now call biotechnology. An important factor in our success has been that we have to be able to draw on top people—the top 2 percent of all Ph.D.s. It's easier to find these people here than anywhere else in the world."

Software: telling computers what to do

Computers are constructed of two basic parts: hardware and software. One way of defining the difference between the two is that the hardware represents the basic processing power and memory of the machine, while software controls how that processing power and memory is used.

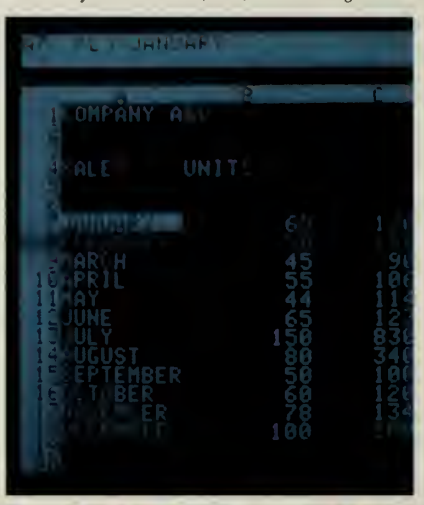
In the early years of the computer industry, software was almost an afterthought; all the investment and attention was focused on the extraordinary promise and progress attained in hardware. That has largely changed now. Future improvments in industrial or office efficiency will depend on finding better ways to control the power computers already have: for instance, redesigning "user-friendly" terminals, developing useful decision support systems, and writing programs that support new forms of industrial automation.

This change is particularly evident in Massachusetts, where the number of firms devoting themselves to innovative software products has been increasing steadily. While figures are hard to gather at this early stage of the industry, analysts believe that the market for new software is growing at 40 percent a year. It seems clear that new firms are establishing themselves here at at least that rate—and from a high base.

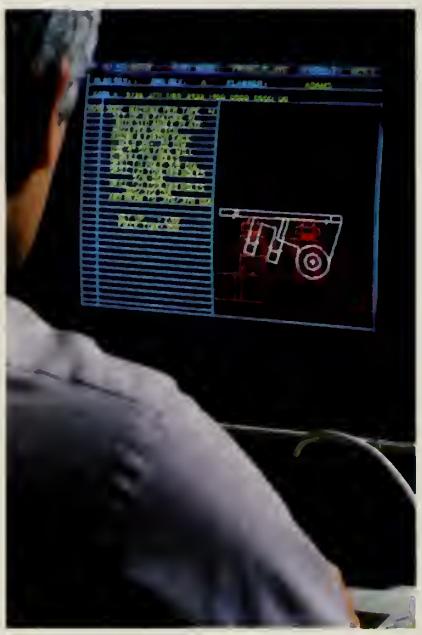
Some of the most rapidly rising stars in the universe of new software applications are companies developing computer-aided design (CAD). These systems eliminate the drudgery of hand-drafted engineering designs by allowing interactive creation of visual displays on videoscreens. The systems also permit "inspection" of the object drawn by revolving the image on the screen, allow production of printed copies of any image created, and otherwise greatly speed up the design process. The sophisticated software engineering skills to create these systems are heavily concentrated in Massachusetts, led by Computervision and Applicon, the pioneer companies in the field in both hardware and software, and joined recently by myriad small new firms developing the advanced software concepts.

On these pages are some examples of the companies and products that are creating this new software industry.

VisiCalc programs for home computers, created by Software Arts, Inc., of Cambridge.



A CAD system, created by Computervision, is shown on the display terminal.



Honeywell business computer

Index Systems, Inc.
Cambridge, Massachusetts
Dr. Thomas P. Gerrity, President

"As a firm, we're focused on the effective use of information systems. We're also very diversified within that focus in that we provide a full range of professional services from very high-level strategy-making all the way through to systems implementation. In addition to having a lot of people with a strong business perspective on the context for information systems, we also have an active advisory board of academicians from Harvard, MIT, and the other universities in the area that work with us on our client projects and are engaged with us in management education services. We do a lot of educational programs for our clients in conjunction with those faculty members, and by working with faculty we stay pretty much abreast of the state of the art.

The gradual shift to more and more of a high technology base is just terrific in terms of the health of the local economy and the prospects for the future. What we have at Index Systems is a service firm that is paralleling completely the growth prospects of all the high technology firms around here. It's a pleasure to be on the right side of the power curve in terms of unemployment rates and the strength of the economy. I think that's going to continue for the foreseeable future, and I think it's going to make us much more recession resistant in Massachusetts."

Artificial Intelligence Corporation
Waltham, Massachusetts
Dr. Larry Harris, President

"Compared to other countries, the United States is notable in terms of the entrepreneurial atmosphere that it provides. Massachusetts and the West Coast are certainly the high points within this country in terms of fostering the financial and technological environment that was needed to get this company started.

We're at the extreme edge of high technology within the computer field. While almost any computer-oriented product is high technology, we're on the leading edge of that. So we have to be near a pool of extremely capable people with the appropriate technological training to expand our company in a reasonable manner. Another reason for being in Massachusetts is that most of the software companies who use our products are located right here: Management Decisions Systems, Cullinane Database Systems, as well as a number of others. Selling our products through them allows us to leverage the use of their existing marketing channels to quickly proliferate our product in the marketplace. This is particularly important to a company such as ours that is introducing a totally new technology.

Our physical location here is also exceptionally convenient. Where else could you find an office park that happens to have links to both of the international computer networks located right in the building? Without making any phone connection, we can tie directly into either our own computer or any of the hundreds of other machines on the network in this country, Europe, and Japan."

McCormack & Dodge Corporation
Needham, Massachusetts
Mr. Frank Dodge, President

"McCormack & Dodge specializes in the development, marketing, and support of financial and accounting software packages. These packages are designed to automate accounting operations and financial management information. We are growing rapidly and currently have two products under development which will greatly extend our capabilities.

Easily, 95 percent of our technical group comes from Massachusetts. We believe there is more of a supply of the people we are looking for in Massachusetts because of the concentration of high technology and the wide variety of college programs. We also find it pretty easy to attract people from other parts of the country, because the area has some unique things to offer.

There's another thing that's good about Massachusetts and that's a real awareness of what our industry is all about. As a result, venture capital for high technology firms is probably more available here than it would be in other parts of the country."

The fruits of success

The cultural and social contributions that innovative, knowledge-intensive industries make to a region are well known. They attract a different kind of person and a different kind of company: ambitious, intellectually adventurous, demanding of quality in all spheres of life. The economic performance of knowledge-intensive industries is equally important. In the nation at large, high-tech industries have in recent years provided as much vitality and stability, if not more, than what are sometimes called the "basic" industries. This being so, the demonstrated continued success of Massachusetts in creating and supporting innovative industries augurs well for the state in the future.

Two excellent examples of Massachusetts' success at supporting knowledge-intensive industries and of the contributions such industries can make to the state are the minicomputer industry and the Boston health care complex. (While the Boston health care complex may not be an industry in the technical sense, it is in terms of investment, employment, and general impact on the state.)

The home of minicomputers

Computers were originally invented during World War II to solve problems involving large numbers of calculations. The first commercial machines followed those models and were sold to companies with very large computational needs, such as life insurance companies. There were not many such concerns, and all the market research of the time concluded that demand could be satisfied with a few thousand machines at most.

Today, hundreds of thousands of computers are installed in organizations all across the nation. That computer use took a direction so radically different from that predicted by all the experts of the time is due in part to the efforts of several Massachusetts minicomputer companies—Digital Equipment, Data General, Prime Computer, and Wang Laboratories.

How did this happen? Basically, early in the sixties, small companies sprang up to sell small, powerful computer segments at a fraction of the cost of an entire machine to sophisticated users that wanted those segments for data control rather than calculation (for example, to control instruments). Gradually, these companies worked down the scale of user sophistication, widening the market case by case, problem by problem, use by use. This took dedication, imagination, and a constant stream of innovative solutions to new problems.

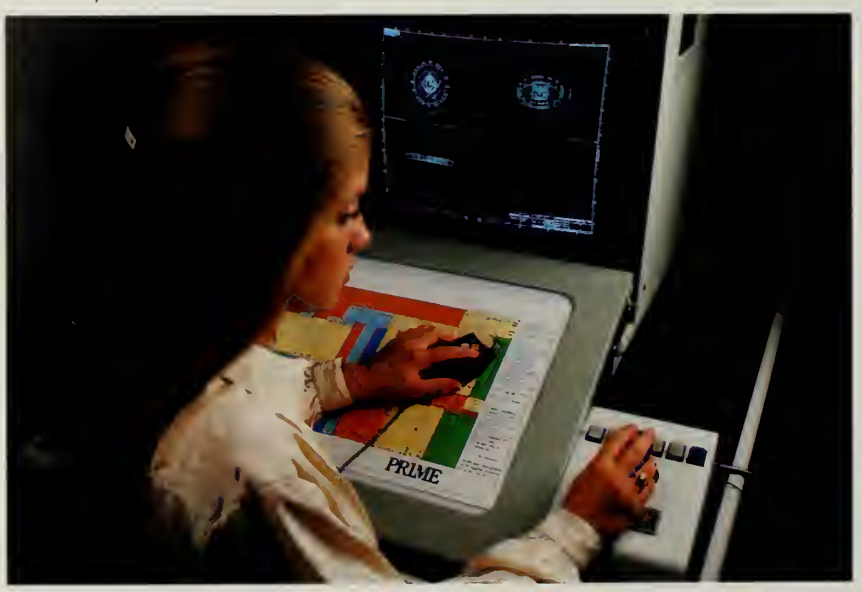
Why did this happen in Massachusetts? All the parts were here. The sophisticated users, the problem-solvers, the venture capital organizations, the research laboratories, and a ready pool of management expertise. The result can be glimpsed by anyone driving down Route 128—or looking at the state's employment record. Today, minicomputer companies employ almost 10 percent of the state's manufacturing work force.

Data General Corporation
Westboro, Massachusetts
Mr. Edson D. de Castro, President

"Today, the small computer business is economically important worldwide, but it was born and nurtured in Massachusetts. Since Data General's birth in 1968, our Massachusetts employees have helped develop our business to more than a half billion dollars in annual sales—that takes talent and dedication.

While the four-season recreational advantages of the area are often cited as attractions, I like to think that the presence of high technology industry and the creative people working in this industry are just as important. They're important in continuing to challenge the people who work here now and in attracting new people."

Computer aided drafting on a Prime Computer Medusa work station.



The best of medical care

The high quality of medical services in Boston is well known: from Saudi king to movie star, people in need of the best care are often referred to Boston medical institutions. If success be the achievement of excellence, then the Boston medical community has a remarkable success story to share.

The community began 200 years ago when Harvard founded the third medical school in the country. About a hundred years later, following the lead of Harvard's president, Charles Eliot, medical education and practice in the area was put on a scientific foundation. Since then, the community has been responsible for a large share of the flow of innovations that has characterized the changing nature of medical practice in this century, and has grown impressively as a result. The community is located mainly in three clusters:

- The Harvard Medical School area, including the Harvard Schools of Medicine, Public Health, and Dentistry; Brigham and Women's Hospital, site of the first successful kidney transplant; the Children's Hospital Medical Center, which has the largest pediatric research center in the world; the Sidney Farber Cancer Institute; the Joslin Diabetes Center; the New England Deaconess Hospital, the first hospital in the nation to have a bank of blood platelets ready for immediate transfusion; and the Countway Library, perhaps the leading source of medical documentation in the country.
- The Massachusetts General Hospital area. MGH is one of the few hospitals in the country accredited to grant degrees, and is generally acknowledged to be one of the two or three best hospitals in the country. Medical institutions near it include: the Massachusetts Eye and Ear Infirmary; the Shriners Burns Institute, where artificial skin was developed; the Retina Foundation; the Vincent Gynecological Service; and McLean's Hospital, the third psychiatric institution founded in the United States.
- The New England Medical Center area. Both Tufts and Boston University medical schools and affiliated hospitals are located here, as is the new U.S. Human Nutrition Research Center and the unique new veterinary school of Tufts University. Tufts also has its Sackler School of Graduate Biomedical Sciences here, and other centers for research on cancer, spinal cord injuries, arthritis, as well as many other specialties are in the area.
- Massachusetts also has a fourth medical school, located in Worcester, where the University of Massachusetts Medical School is the center of a significant health care community.

Not only does the entire New England region benefit from access to these services, but the creative energies of doctors, researchers, and specialists is the foundation on which the new biomedical industry is being built in Massachusetts.

The "Boston Elbow," powered by self-contained batteries, is controlled by electrical nerve signals from the amputee's remaining upper-arm muscles. This prosthetic elbow was developed in a cooperative effort by Liberty Mutual Insurance Company, MIT, MGH, and Harvard Medical School.

Tufts University
Medford, Massachusetts
Dr. Jean Mayer, President

"Tufts University has a School of Veterinary Medicine which not only is quite new but which, of all veterinary schools in the country, has the closest relationship to a medical center. The School of Veterinary Medicine shares the Departments of Basic Sciences with the School of Medicine, the School of Dental Medicine, and the Sackler School of Biomedical Sciences. The clinical departments work with the clinical departments of the medical school, for instance, to look for sources of human diseases which are found in animals; this also extends considerably the range of experimental animals available to the medical school. In effect, the veterinary school is of relevance to human health. A very important further area of collaboration is in the development of surgical techniques which can be applied to both human beings and animals. The veterinary school also has an enormous potential role in agricultural development, a role in generating new industries (such as aquaculture and toxicology), and a role in environmental medicine.

We also have what we think is by far the best nutrition program and the largest nutrition research center in the country. It's supported by the Department of Agriculture, but managed by us.

We have found that Boston is such a mecca for biomedical sciences that you can bring people here when you couldn't get them in any other area."

The International Connection

Over the last century, as the world has "grown smaller" and more integrated markets have grown larger, more buyers and sellers have access to each other.

For a state to have a role on this larger stage, for it to prosper in these widening markets, it must have a specialization—something to differentiate it from the lengthening list of worldwide competitors.

Massachusetts has such a specialization: innovation and the innovative community. In essence, we "sell" not only our products but the benefits of joining the community here: of opening a window on significant portions of American technology. These have proved increasingly attractive to foreign companies, which have been establishing themselves here at greater rates each year and are now a significant element in our economy.

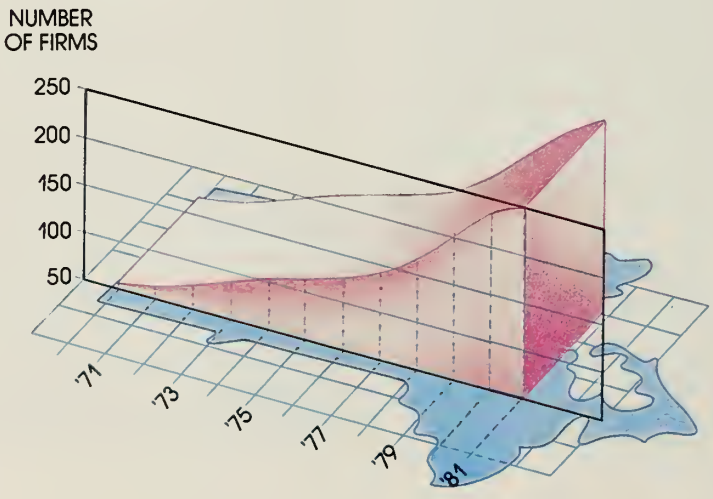
International trade, whether carried on by foreign-owned or by domestic companies, has always been a mainstay of the state. With clipper ships or computers, for three centuries Massachusetts has been an active participant in commerce on or over the high seas. Because we are one of the leading export states in the United States, we have also developed a concentration of foreign trade services. The constant stream of international traffic that flies out of Logan International is only the most dramatic illustration of the level of service we bring to international trade. The structure of services that supports international business relations includes a broad range of international specialists in banking, law, and brokerage relations. (The First National Bank of Boston has 117 branches in 34 countries.)

While most of these services are private, state government also actively supports international business. Three foreign trade zones have been established—in New Bedford, Boston, and at Logan Airport. The Massachusetts Port Authority, an independent public authority, provides assistance in foreign marketing to companies that lack international experience. The state has formed the Massachusetts Foreign Business Council, a quasi-public organization composed of local business leaders, to offer "one-stop" assistance to foreign investors on such questions as site evaluations, investment studies, financing assistance, and general liaison with other authorities.

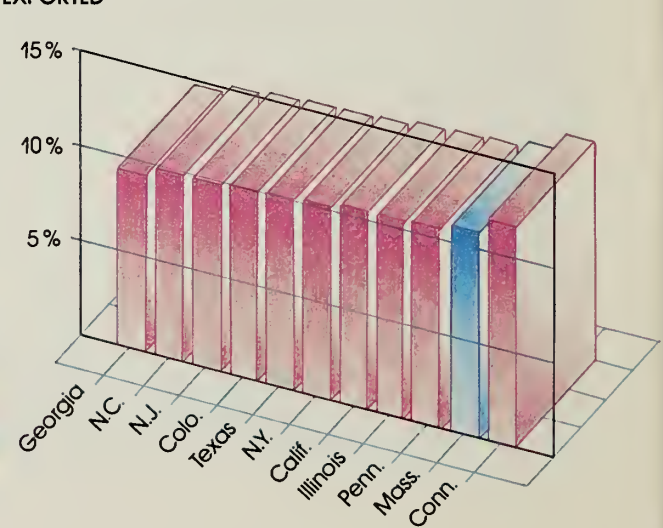
A major initiative undertaken recently is a project called BOSCOM. BOSCOM is an international marketing center for the computer and communications industry located in a recycled pier. The marketing center will provide a showcase for the products of leasing businesses at a site doubly convenient for foreign visitors: the pier itself is very close to Logan International, while Logan is the closest American airport to Europe.

"A model of the BOSCOM marketing center, to be located on Commonwealth Pier."

The number of foreign companies established in Massachusetts has increased dramatically over the last decade.



Massachusetts continues to be one of the leading states in the proportion of its output shipped overseas.



Scitex America Corp.
Bedford, Massachusetts
Mr. Paul L. Rosenbaum, President

"Scitex America was originally located in New York and moved here to Massachusetts for a variety of reasons, most important because of the very strong technological base here. We have the availability of MIT and Harvard, from which both Scitex America and our parent Israeli company use a number of the professors to help us in our product planning, market planning, and technological work. This is one of the real resources of the Boston area which distinguishes it from other cities.

We plan to expand from our sales and service activities here by conducting final system integration in Massachusetts. A portion of our equipment is manufactured in the United States by Hewlett-Packard, Ampex, and other suppliers. Other parts of our system are manufactured in Israel, such as our console and output plotter. Currently, the U.S.-manufactured portions of our products get shipped to Israel where they are integrated with the Israeli manufactured assemblies and shipped to our U.S. customers. In the future, we plan to receive U.S.-manufactured assemblies and Israeli assemblies here for final assembly and testing. What a company needs for this type of activity is not so much assembly personnel, but rather the skilled technicians to test the final system. And here in Massachusetts, because we are at one of the poles of the computer industry, that skill level is available."

Doulton Aerospace, Inc.
Peabody, Massachusetts
Mr. Helmut E. Stein, President

"We had looked at four states—Ohio, the southern tip of New York, Long Island, New Jersey, and Massachusetts. When you try to find a place for a corporate home, there are many questions that you have, and there's no way that you can get answers to all of them. In the end, you throw your lot in with those who answered these questions in the most convincing and competent way. You extrapolate from what you hear to what it is you're likely to get after you settle down. It was the Massachusetts Foreign Business Council and their close ties with the federal government that literally moved mountains for us. Most, most impressive.

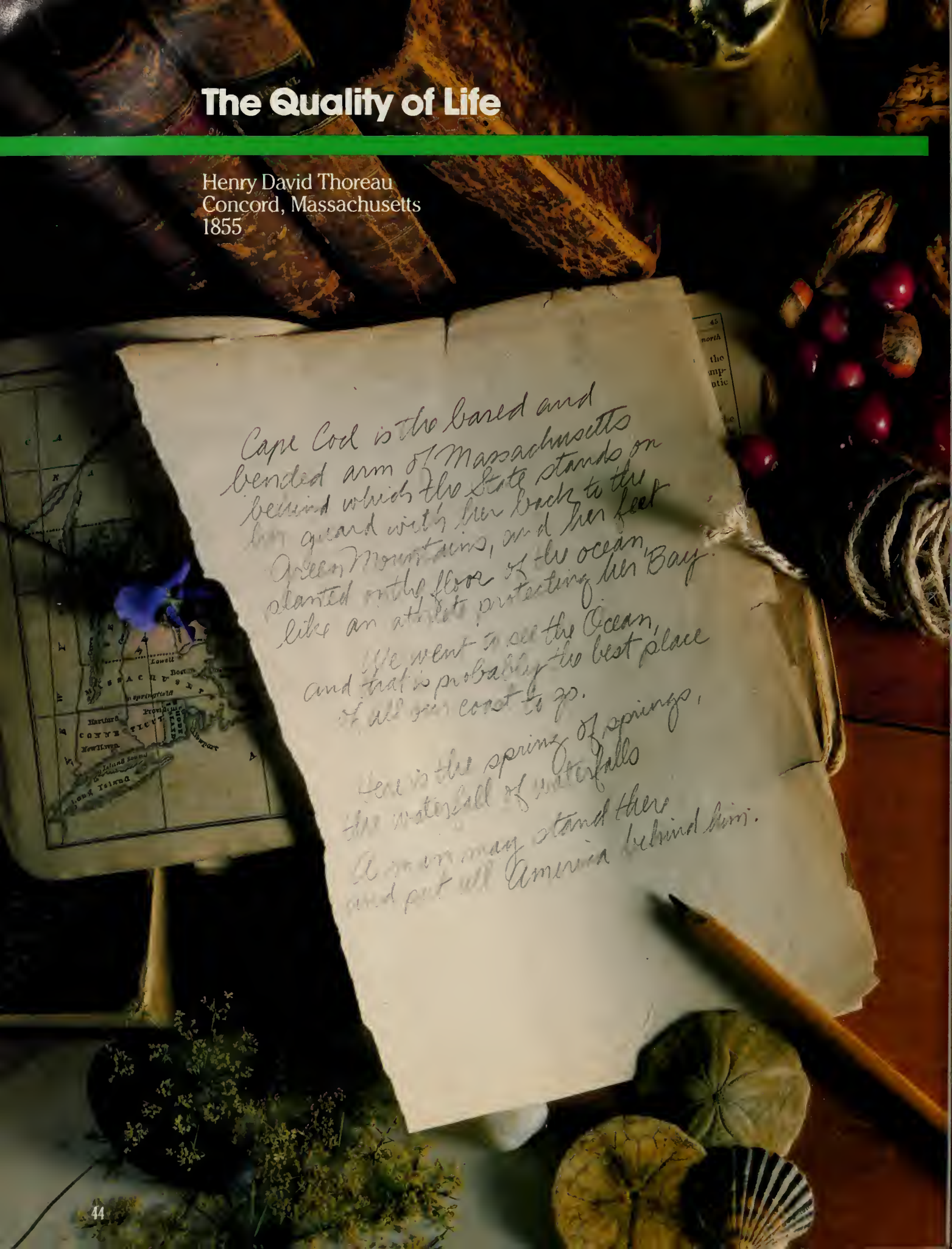
It is interesting, when you make the rounds of different state offices, that, at first, the differences in their proposals tend to be very great, very large. What you're interested in, of course, is: to what extent are taxes abated at the state level and the local level; to what extent does the government help you to get the federal funding for the work you're doing; and the labor supply—at what rate is labor available, is it skilled to fit your particular needs and so on. But, as you keep pursuing this, all these differences tend to disappear, but one—which is the availability of labor at competitive prices and local taxes. That, you cannot change. We found that the north shore area of Massachusetts offered to us, on balance, a set of conditions that we felt fitted our needs best."

JEOL USA, Inc.
Peabody, Massachusetts
Mr. Ryuzo Hasegawa, President

"The headquarters of our U.S. operations is here, including all of our sales and service administration. The major areas we considered as locations were Boston, New York, Washington, Philadelphia, Baltimore, Chicago, Texas, Denver, and San Francisco, because those are the principal scientific areas. Boston presents a very nice picture from the standpoint of education, arts, and a number of other things. Another important fact is that it is very easy to get people to visit you in Boston. How many people across the country have either attended school here or have colleagues who have attended school here, or are some way affiliated? Being in an area that is attractive to scientific people is very important to us, because in our business most of our customers have to come here. We have 13 laboratories—roughly $3½ million worth of instrumentation, specifically electron optics systems. The purpose of our laboratories is to do demonstrations and development work, to train our customers and our own engineers, and to do various forms of application work for our customers. Massachusetts has been an excellent location for us to do this for over 15 years."

The Quality of Life

Henry David Thoreau
Concord, Massachusetts
1855


Cape Cod is the bared and
bended arm of Massachusetts
behind which the State stands on
her guard with her back to the
Green Mountains, and her feet
planted on the floor of the ocean,
like an athlete protecting her Bay.
and that is probably the best place
for all men east to go.
Here is the spring of springs,
the waterfall of waterfalls
where we may stand there
and put all America behind him.

Ten Communities

Massachusetts' eventful social, cultural, and economic histories combined with its variety of landscapes have endowed the state with a remarkable range of local cultures. The diversities of living this affords can be sampled in these 10 communities.

Chatham

There is a distinctive quality to the towns of Cape Cod, a serenity, a stability—that was first glimpsed by Thoreau and that they still possess. Chatham is one. With its 60 miles of Cape coastline, white sand beaches, inland waterways, and mild winters, it is one of the towns chosen as a place to live and visit by people with the time and freedom to choose the best.

Pleasant Bay

Concord

Massachusetts is a state in which many events of historic national importance have occurred. Concord, 30 minutes west of Boston, is the home of two such events. The first was the successful repulse of a British column in 1775, which soon led to the Declaration of Independence; the second was the founding of an original American literature, 60 years later, by Emerson, Thoreau, and Alcott. Life in a town where the streets and bridges are enshrined in school books and where neighborhood festivals celebrate the events of our national history is a special experience. America touches one in Concord in a sense that is hard to gain elsewhere.

Old North Bridge

Newburyport

Life in Newburyport, 35 miles north of Boston, is influenced almost as much by the Atlantic and the town's great barrier beach as by the mainland. Birthplace of the US Coast Guard, a historic center of seagoing trade, and the place where many ship captains built their stately homes, Newburyport is also the site of the most famous and popular nature reserve in the state—the Plum Island Reserve—as well as a major marine recreational center. Newburyport is less a city on the coast than of the coast.

Greenleaf House

Newburyport Light

Surf casting off Plum Island

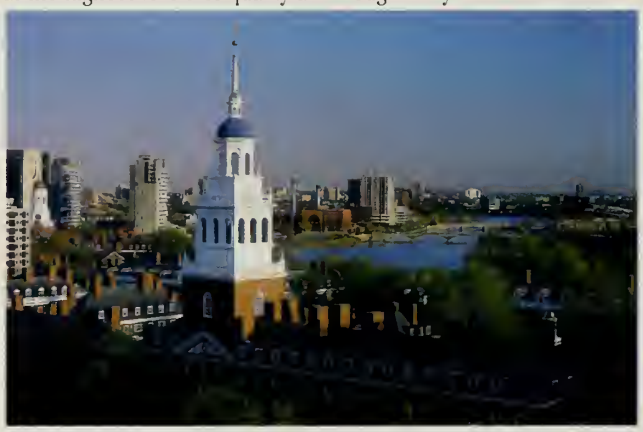
Northbridge

From time to time, any city or town must renew its economic foundations. Northbridge, near the center of the state in the Blackstone River Valley, played a historic role in the early development of the textile manufacturing industry in New England, a role symbolized by the two huge Whitin Manufacturing Company mills which still dominate the heart of the city. For a time, those buildings were empty, but recently the town has attracted new industries to occupy these imposing structures. This achievement, together with the charm and accessibility of the surrounding areas, has made Northbridge into a town on the way up again.

The former Paul Whitin Cotton Mill, now the Cotton Mill Apartments.

Cambridge

Cambridge, located next to Boston, is not large—numbering only a little more than 100,000 people. Yet few cities 20 times its size present the concerts, plays, lectures, readings, performances, debates, that it does—often by the best or most prominent in their field. Cambridge is inexhaustible—a city for those who want to sample the full range of what our culture can offer at the highest levels of quality all through the year.



Harvard University on the Charles River.

Chicopee

To some it seems that Boston is the only big city in Massachusetts. But the cities of Springfield, Holyoke, and Chicopee cluster together along the Connecticut River in western Massachusetts to share over half a million people. The economic renaissance of this historic area is typified in Chicopee, once the paper-making center of New England and now home to many newer industries that are recycling the well-preserved mills. In arm's reach of the city center are all the varieties of life that make Massachusetts so attractive: half a dozen renowned schools, rolling hills and verdant farms, a major urban setting, and a hard-working mixture of Yankees and colorful ethnic groups.

New industries in old mills

Fitchburg

Town and gown relations are often synonymous with Hatfields and McCoys. Not so in Fitchburg. Fitchburg State College provides this city of 40,000 with not only a rich menu of culture and activities, but also a close working relationship to the business community. Set in a rolling countryside of orchards, lakes, and forests, Fitchburg has created a warm attachment for the generations of artisans and educators who call this attractive city their home.

Fitchburg Paper Co. Division of Litton

Williamstown

Home of Williams College, Williamstown is set in the rolling Berkshire Mountains of Western Massachusetts. Its partisans, of which there are many, believe that it comes as close as any real place can to simple perfection. The landscape is a tourist attraction in itself—particularly in the fall—and offers all the pleasures of the country (skiing, fishing, hunting, hiking) together with the satisfactions of having a first-rank college, outstanding regional theater, music, and the arts as neighbors.

Winter festival. Williams College

Clark Art Institute

Fall River

When immigrants arrive in a foreign country, they often build communities in which they recreate the flavors and colors of their native land. Usually, this influence is restricted to a neighborhood or two. However, Fall River, a historic port city in the southeast corner of Massachusetts and home to a large and prosperous Portuguese community, is an exception. Here, the influence of Portuguese culture on the festivals and holidays, the importance of religion and family life, the cuisine, and fashion and design is a heritage shared by the whole city. Fall River has always lived closely with the sea, and to live in this part of the state is also to share deeply in the pleasures of the shore and the open water.

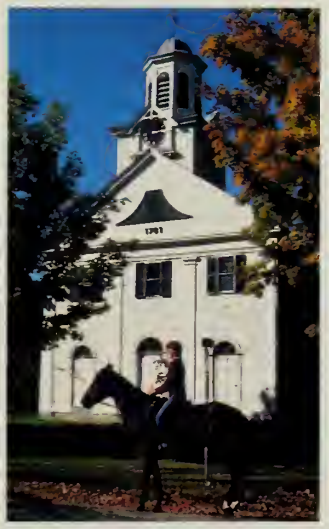
The corner grocer

St. Ann's Church, Fall River.

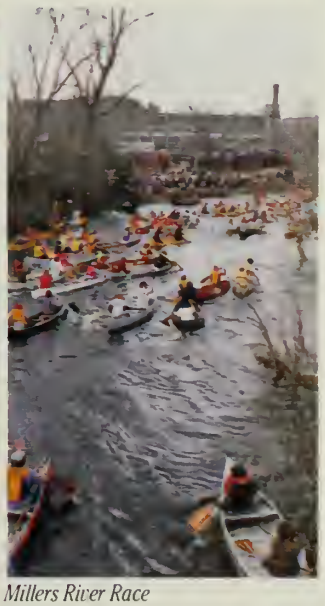
Orange/Athol

The neighboring towns of Athol and Orange exemplify the pleasures of rural life in Massachusetts. Located in an area abundant with state forest lands, lakes and ponds, Athol and Orange are truly typical of quaint New England living. The beauty of the environment is complemented by the social and cultural diversity created by the nearby Five College Consortium, including the University of Massachusetts, and the Colleges of Amherst, Hampshire, Holyoke, and Smith. But rural does not mean isolated. Boston is a scenic 90 minute drive, the Springfield area, 40 minutes along the Connecticut River, and the Orange Municipal Airport provides air commuter connections.

Orange Municipal Airport



Congregational Church, Orange circa 1781

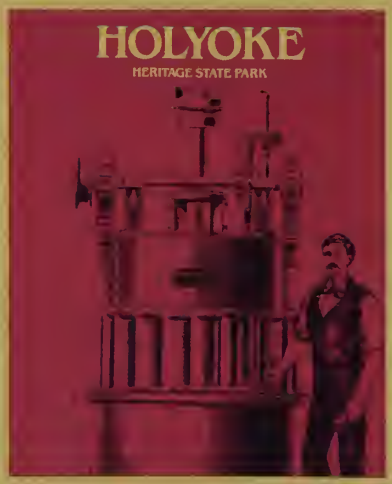


Millers River Race

Searching the Past and Shaping the Future...

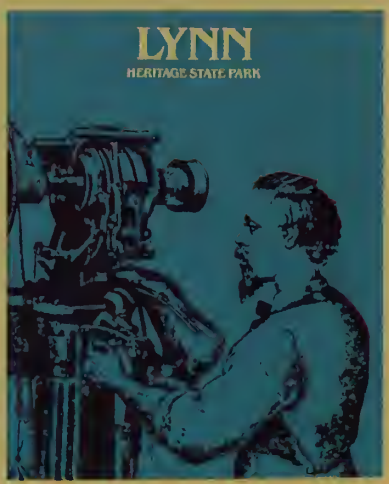
The Heritage State Parks, under construction by the State's Department of Environmental Management, celebrate the rich and varied history of the Commonwealth cities. These new parks, slated to open in 1984, combine beautifully improved green spaces and restored historic buildings with fascinating exhibits bringing to life the people and events that shaped each city's history; and by creating quality urban environments attractive to new private investment, the parks reinforce local efforts to "revitalize" the cities.

Holyoke's park occupies a full city block in the center of the city, bordering the First Level Canal. In a landscaped 4½ acre sitting, a new solar visitors' center incorporates fascinating exhibits on the city's planned layout and development into a complex, varied industrial community.

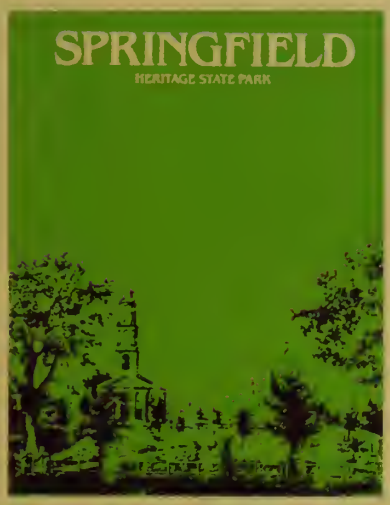


Dedicated to the heritage of the city's working people, the park includes exhibits on Lawrence's labor history in a restored 19 c. workers' boarding house, canal- and river-side esplanades and the restored Campagnone Common, with its beautiful Robert Frost fountain.

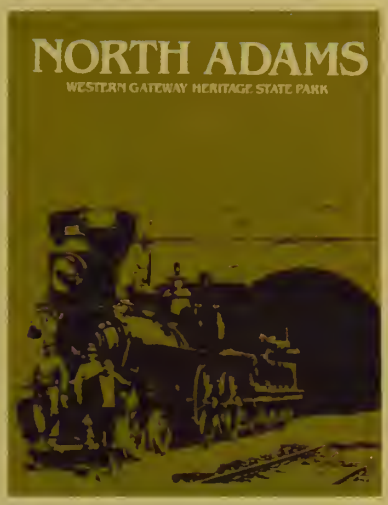
The park in Lynn, celebrating the city's preeminence as a shoe producing center, includes a 5-acre waterfront park on Lynn Harbor, and a related retail and condominium development.



Historic Court Square in the center of downtown Springfield has been restored and expanded. The Heritage State Park also includes a new outdoor performance pavilion at the city's Riverfront Park.

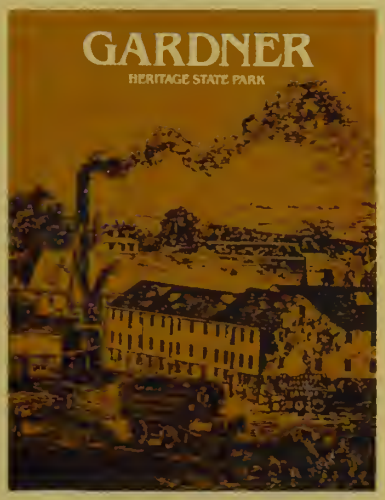


Completion of the Hoosac railway tunnel through the Berkshires in 1873 transformed North Adams into the "Western Gateway" of Massachusetts. The Heritage State Park commemorates this period of the city's history, through interpretive exhibits and a full restoration of the downtown freight yard. High quality shops and eating places in the freight buildings contribute to visitor enjoyment.



Fall River's Heritage State Park celebrates the city's heritage as the world's premier textile producing center. A new 8½-acre waterfront park along the riverfront harbor includes a public parking facility and a new mill-style visitors' center incorporating a multi-projector slide presentation. The U.S.S. Massachusetts battleship and the Fall River Marine Museum are on adjacent sites.

Gardner's heritage as the "Chair City of the World" is the focus of the Heritage State Park. A series of beautiful downtown plazas complement exhibits on the furniture industry which are presented in a restored 19 c. firehouse. Major renovations to the landscaping around the city's scenic Dunn's Pond are also a part of the park development.



Focussed on the city's historic waterways—the Merrimack River and the network of canals—the park in Lowell celebrates water power. Canal tours, waterfront parks, and a major interpretive exhibit complete the development of this first Heritage State Park.

The awareness of history and renewed sense of place created by the Massachusetts Heritage State Parks enhances a community's image and stimulates economic growth. In turn, a positive environment, for business and for people, is emerging in our historic urban areas. By searching our past we are shaping our future.

HERITAGE STATE PARKS

The Arts

The new west wing, Museum of Fine Arts, Boston

The Elma Lewis School of Fine Arts

Seiji Ozawa
Music Director
Boston Symphony Orchestra

"I am very happy to be the Music Director of this great Orchestra in such a special place as Boston. This city and the entire state have a unique cultural flavor. Our audiences at Symphony Hall are enthusiastic music lovers. Tanglewood, in Western Massachusetts, is the ideal setting for our summer music festival. There, we combine performances and teaching in the natural beauty of the Berkshires.

The Boston Symphony and the Boston Pops have a warm relationship with the people who live there. Our concert seasons and international tours are followed with great enthusiasm. Bostonians root for the BSO like they do for the Celtics, Bruins or Red Sox."

Boston Symphony Orchestra

Sarah Caldwell
Artistic Director
Opera Company of Boston

"Boston is a state of mind with endless fascinations that can never be fully explored. Its music, its paintings, its books, its universities and hospitals, its wonderfully funny little shops and restaurants, and most of all, the variety of interesting and interested people—the scientists and doctors and teachers and artists—keep it forever fresh and surprising."

Opera Company of Boston

Tanglewood Music Festival

John Updike
Author

"I think if you're trying to be a writer this is a very forgiving state with a long history of literary activity and a certain subliminal respect for the life of the mind. I've been comfortable here, have been accepted as a neighbor by New Englanders, and for 25 years now have been able to work in this atmosphere . . . I like being near the sea. I think it's always platonic; it cleanses the mind to see something so big other than yourself."

Music class at the National Center of Afro-American Artists

Williamstown Theatre Festival

Jacob's Pillow Dance Festival, Becket

Leonard Nimoy
Actor
Television and Movies

"Massachusetts has always ranked high in America's subjective assessment. It is viewed as the place where America began—geographically, politically, artistically, and technologically.

From my boyhood days in Boston's West End to today, the awareness of Massachusetts' continuing contribution to our nation's well-being has been a positive influence on me and a source of pride about my home state."

The Boston Ballet

Julia Child
Chef, Author and
Television Personality

"As to why we chose to live here, in spite of the climate we love the area and the people and we find it a most stimulating place to be. Although we have lived all over the world, we wouldn't think of having permanent residence anywhere else than right here in New England, and especially in the Boston-Cambridge area."

Brother Blue, storyteller

A Place To Stay

Over 40 million people each year visit the movable feast of places and events seen on these pages. In all seasons and to all parts of the state they come—and they need places to stay and eat. They will find them in abundance from among the 7,500 new rooms being built—13 new hotels in Boston, major new hostelries in Worcester, Springfield, Cambridge, and the many other communities that afford access to the sites and sounds of the Bay State. The guidebooks will lead the lovers of history to the many charming country inns on the state's byways; those who prefer the sky for a roof to scores of campsites from ocean shores to the Berkshire Mountains; and everyone to some of the best dining to be savored anywhere. You will find we lack for nothing in hospitality.

Windflower Inn, Great Barrington

Harborside Inn, Martha's Vineyard.

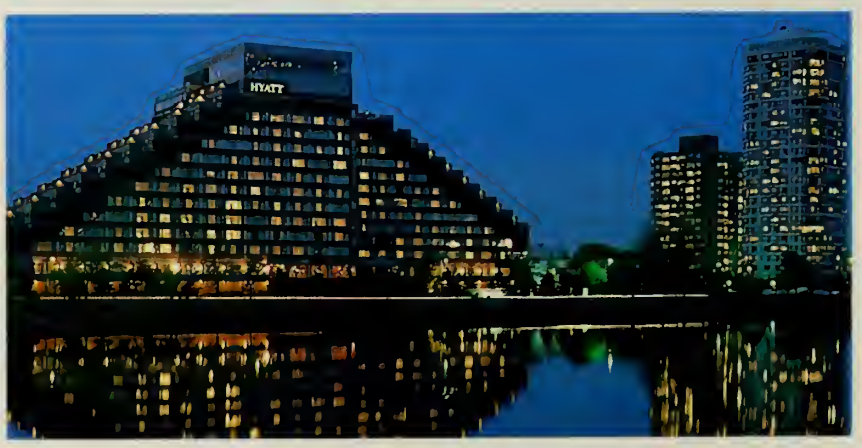
Hyatt Regency Cambridge

Red Lion Inn, Stockbridge

Longfellow's Wayside Inn, Sudbury

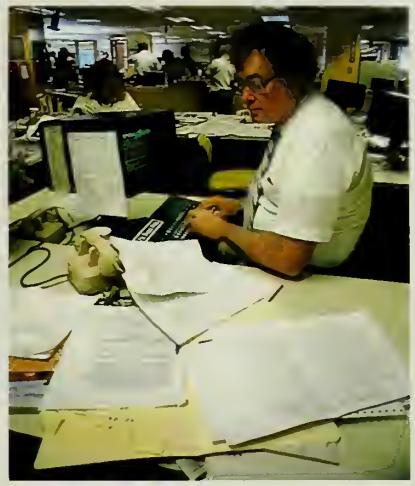
Anthony's Pier 4
Boston, Massachusetts
Mr. Anthony Athanas, President

"We are in an area which is very vital, very dynamic for my industry and no matter how much talent one may have in developing one's business, it must be conducive to the area. We are one of the largest restaurants in the world in the number of guests that come here. Over three-quarters of a million people go through these doors every year. We're not in a desert here. Our outstanding universities, hospitals, industries and other renowned factors attest to Greater Boston's international repertoire. Having this kind of an atmosphere here is really what has contributed tremendously to the growth of my business and Boston's restaurant industry. Since Anthony's Pier Four was established in 1963, an appreciable number of other restaurants have grown up near us. I just love this area. My four sons, who are in business with me, also love this area and would be most reluctant to leave it—they range in age from 27 to 39."



The Media

Massachusetts is a media-rich state. It is home to several of the foremost television and radio stations, newspapers, and periodicals in the nation largely because of the viewing, reading, and listening interests of the state's residents. The Greater Boston area, for instance, has more TV stations—nine—than any other area of comparable size, and is the fifth largest television market in the country. The over 500 newspapers and periodicals published in Massachusetts—far more than states of similar size—reflect both the reading interests of our residents and the importance of the state as a publishing center for major national periodicals such as *Inc.*, *Atlantic Monthly*, and *New England Journal of Medicine*. The vitality of the media in Massachusetts mirrors the vitality of our citizens.



The news room at The Boston Globe.

Liz Walker, TV 4 news

The Channel 2 Auction, WGBH-TV.

Springfield Television
Springfield, Massachusetts
Ms. Kathryn F. Broman, President

"I think it's terribly important that local stations do a good job on local news. Regardless of what the networks are doing, we should serve our own city first. If we don't do that well, we're all in trouble because people want to know what their government is doing. For instance, for many years, we have had a reporter from this station in Boston three days a week to cover the State House scene, and we feature that every night in our news. It's expensive—we take a news crew out of our coverage area—but I think in the long run we do very well by it.

We also feel our coverage has done a lot in helping downtown Springfield come back. We have quite a revitalization program under way in Springfield. I'm on the executive committee of the planning group, and it's very exciting to see all the new buildings going up. By the end of the year, we'll be attracting tourists from all over the region."

Recreation and Sports

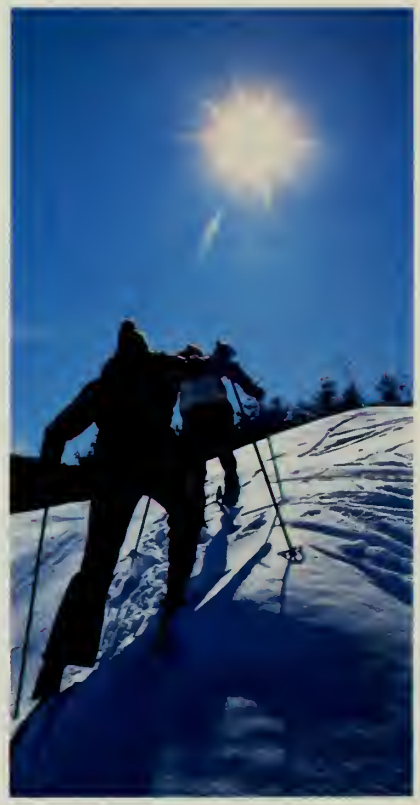
Ballooning in Hampshire county

The Boston Marathon

Dog racing at Wonderland, Revere

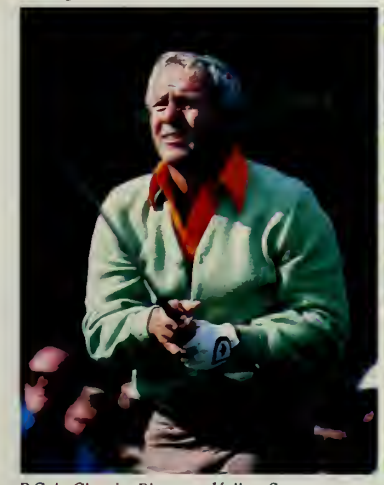
Fenway Park

U.S. Professional Tennis Championship, Longwood Cricket Club



Cross country skiing, Groton Hills Ski Area, Groton

Sailing off Scituate



P.G.A. Classic, Pleasant Valley, Sutton.

Senior's Classic, Marlboro Tournament

New England Patriots

Boston Bruins

Trout fishing in the Berkshires

Sandra Haynie, 1982's Boston Five Classic winner

Boston Celtics

Sights and Attractions

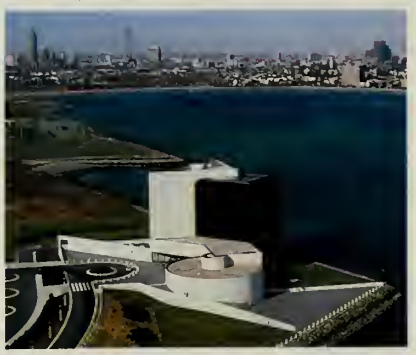
Race week at Marblehead

Edaville Railroad

Macomber Farm, Framingham

Worcester Science Center

Battleship Cove, Fall River



John F. Kennedy Library

Basketball Hall of Fame, Springfield

Hancock Shaker Village, Hancock

Boston Public Garden

House of the Seven Gables, Salem

Old Deerfield

Plymouth Plantation

Kielbasa Festival, Chicopee

Provincetown

Gloucester

New Bedford Whaling Museum

Heritage Plantation, Sandwich

Old Sturbridge Village

The Ocean in the East

Cranberry bog, Carver

Oaks Bluff, Martha's Vineyard

Crane's Beach, Ipswich

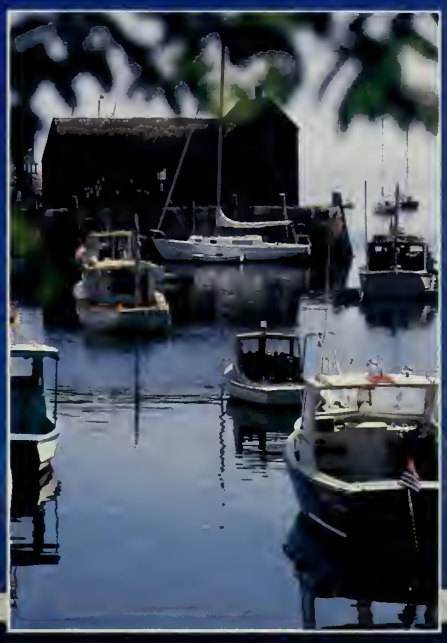
Cape Cod National Seashore

Peak, Provincetown

surf casting, Cape Ann

Nantucket Harbor

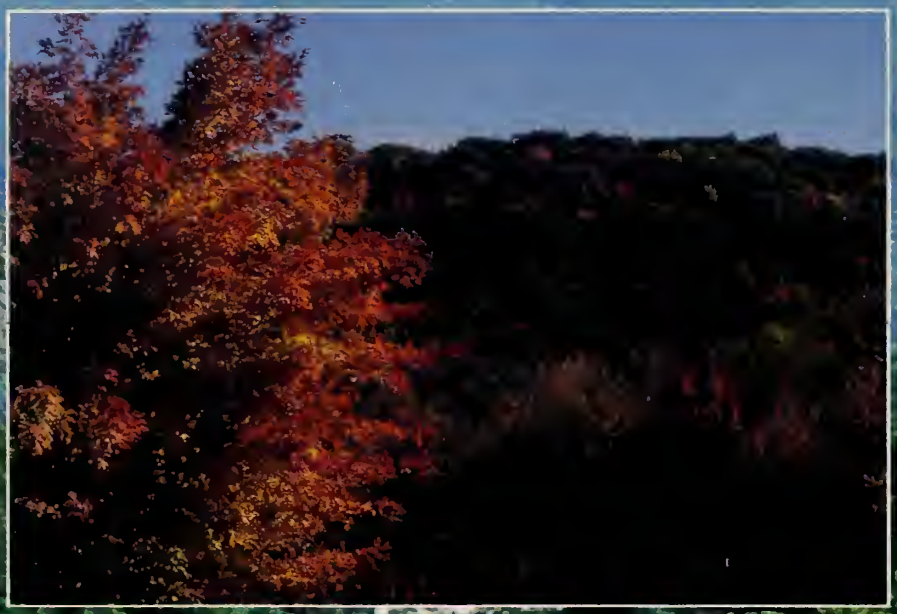
Day sailing, Mattapoisett, Buzzard's Bay



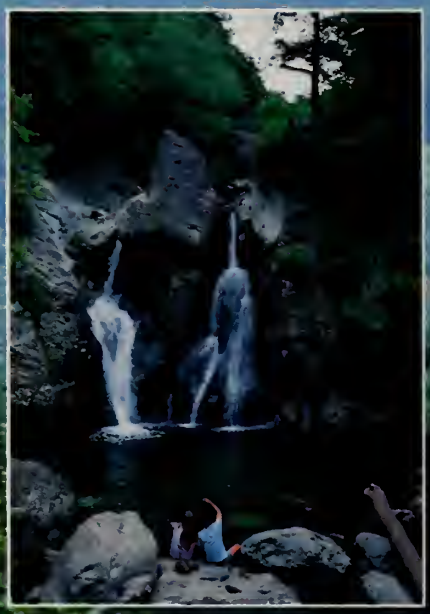
Motif I, Rockport

Salem Harbor

The Hills to the West



Fall foliage, Mohawk Trail



Bash Bish Falls, Egremont

Family skiing, Otis Ridge, Otis

Sailing on the Connecticut River, Sunderland

Dancers at Bucksteep Manor, Washington

Fiddlers' festival, Cummington

Tri-County Fair, Northampton

Covered bridge, Sheffield

Young farmers, Adams

Society of Arts and Crafts

Stockbridge Historical Society

"Big E" the bear, mascot of the Eastern States Exposition.

A State of Quality

In these pages, we have tried to describe Massachusetts,
to review our history and prospects,
display our important features, and give a feeling
for the experience of living here.

In field after field, one theme has kept appearing
and reappearing. That theme is quality:
quality in education, in medicine, in research, in industry,
and in all the activities of our culture—
whether art, music, literature, drama, or sports.

We are a state that lives by high standards and
enjoys the fruits of that commitment.
Our hope for this publication is that, in carrying
this message, it will reach others
who wish to make that commitment with us.

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